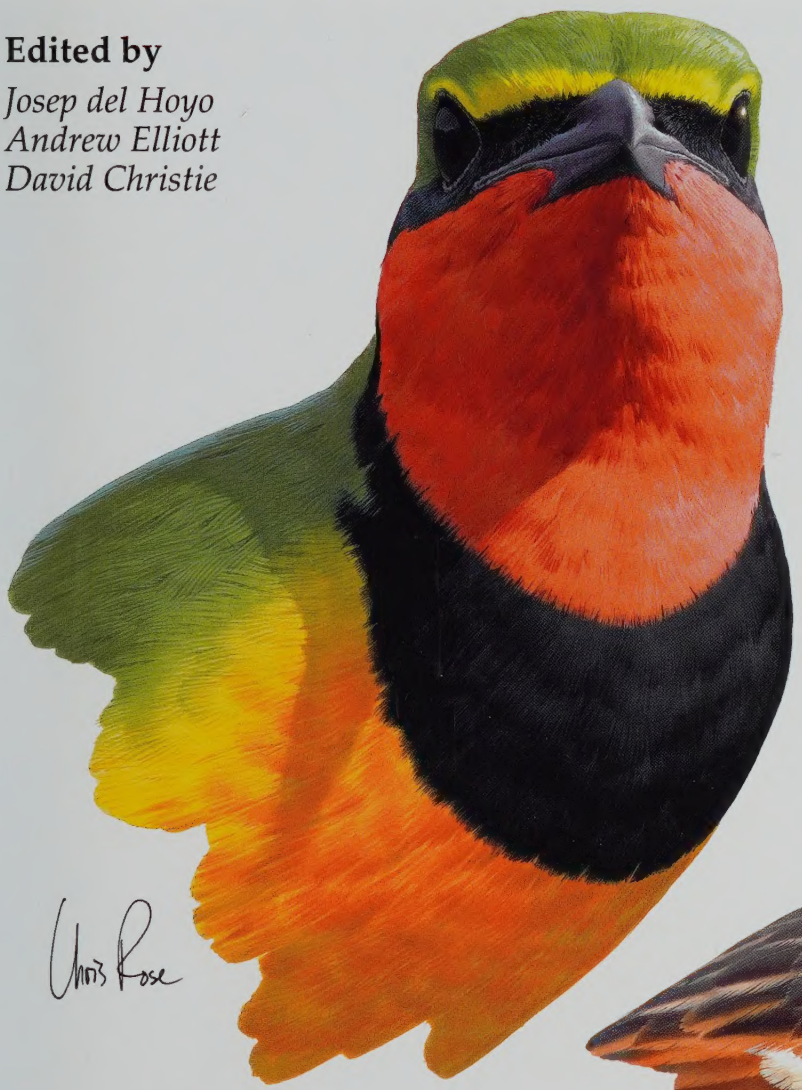
HANDBOOK OF THE BIRDS OF THE WORLD

Edited by
Josep del Hoyo
Andrew Elliott
David Christie

Volume 14
Bush-shrikes
to
Old World
Sparrows





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HANDBOOK OF THE BIRDS OF THE WORLD

Volume 14

Bush-shrikes *to* Old World Sparrows



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BirdLife® INTERNATIONAL

HANDBOOK OF THE BIRDS OF THE WORLD

Volume 14

Bush-shrikes *to* Old World Sparrows

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Foreword

Birding Past, Present and Future—a Global View

For Max Nicholson, who made us all into birders.

Introduction

> *For those who practise it bird-watching is not only a sport and a science, but also something near a religion, and after all its externals have been inventoried the essence stays incommunicable.* **[1]**
>
> Max Nicholson, 1931

Today, in the first decade of the third millennium, birding is a truly global leisure activity, carried out by millions of people throughout the developed and developing world. Yet just a century ago it was a minority pastime, practised by a small number of people, and virtually confined to Britain, North America and parts of the British Empire.

This essay aims to show how, in barely one hundred years, birding went from being the preserve of a few eccentric enthusiasts to the mass-participation leisure activity of today.

Following a brief summary of the history and development of birding during the 20th century, I shall review the current state of birding in a number of contexts: including changes in the demographics of who watches birds, how birding contributes to conservation, the influence of new technology, and the economic impact of birding.

Finally, I venture a number of predictions as to how birding might develop in the next fifty years or so, given the potential impact of global climate change, technological, social and political developments, and the nature of leisure.

Inevitably I have had to be selective in my approach: it is simply impossible to do full justice to the massive topic of the history, development and possible future of birding in such limited space. I have therefore chosen to concentrate on the following broad themes:

- How birding emerged from the disciplines of museum-based ornithology and the collecting of specimens in the field; and how some of that 'hunting and collecting' ethos was retained in modern practices such as twitching and listing.
- How the need to protect birds and conserve their habitats helped recruit people into the pastime of birding: initially through the Royal Society for the Protection of Birds (RSPB) in Britain, and the National Audubon Society in the United States, and later elsewhere in the world.
- How ornithology and birding have developed in parallel: with ornithologists providing birders with 'scientific justification' for their hobby, while birders provide scientific data used by ornithologists in their work, through participation in 'Citizen Science' projects.
- How an expansion in global travel has changed the way we watch birds, both in the developed and developing world, and the resulting impacts (both positive and negative) on the conservation of habitats and species.
- How the economic value of birding has emerged as a key factor in its development as a mass-participation activity, both in the developed and the developing world.
- How new technology, especially in the field of communications and the Internet, has revolutionised the way we watch birds.
- How the demographics of birding have changed: from being the pastime of educated, white, middle-class males into one pursued by a more broadly-based cross-section of humanity.
- How radical changes in the global environment—most notably climate change and its consequences—are likely to affect birds and birding in the 21st century.

Although the practice of watching birds primarily for pleasure goes back at least to the late 18th century (as depicted in *The Natural History and Antiquities of Selborne* **[2]** by Hampshire vicar Gilbert White, 1789), and arguably even further, I have chosen to concentrate mainly on the period from the beginning of the 20th century to today.

During this period—barely longer than a single human lifetime—birding underwent a profound series of social changes which laid the foundations of the way we watch birds at the beginning of the 21st century.

For a more detailed discussion of the early development of birding, including the way birds were perceived in the era before birdwatching became a recognised leisure activity, I refer the reader to my earlier work, *A Bird in the Bush: a Social History of Birdwatching* (Stephen Moss, 2004) **[3]**.

Note:
Readers of this essay may find the material and examples too focused on the United Kingdom and United States. In my defence, I must point out that virtually all the published surveys, analyses and histories of birding emanate from those two countries; and that even when I have quoted examples of more global initiatives, such as bird tourism, conservation programmes or bird clubs and societies, the impetus behind these—and often the people involved—tend to be either British or American.

There are many reasons for this. First, there is the long and distinguished history of birding and ornithology in those two nations. Second, the far higher participation rates in the UK and US, meaning that in terms of sheer numbers a vast proportion—perhaps 90% of the world's birders—either live in or come from there. Finally, the social and economic pressures, especially in developing countries, that make birding beyond the aspirations of the majority of the population.

I sincerely hope that over the coming century this situation will change; and that the foundations laid by British and American birders—and many others—around the world will lead to a truly global community of birders. This may already be happening—the wide representation at the annual British Birdwatching Fair certainly gives a basis for optimism—but as I examine in Part 4, there are factors which may stop such progress in its tracks.

Part 1: Birding Today

> *The entry-level birder... is probably between 40 and 59 years old and is white. She puts in about 10 birding days or fewer per year, trying to squeeze birding into a busy life... This female birder lives in the South in a suburban area, has a modest-to-middle income standard of living, and may not have a college degree.* **[1]**
>
> Ken Cordell and Nancy G. Herbert, 2002

According to the statistics, from a US Fish & Wildlife Service study carried out in 2001 **[2]**, there are approximately 46 million birders in the United States. These represent a substantial minority—more than one in five—of the adult population (those over 16 years old).

Most of these—at least 40 million—are what Americans call 'backyard birders', watching birds in and around their homes. But a significant proportion—18 million individuals, representing almost 40% of those surveyed—travelled at least one mile from their home specifically in order to watch birds.

In the United Kingdom, a recent RSPB survey **[3]** found that there are 2·85 million 'active birders', while the number of people who feed birds in their garden has been estimated at almost 30 million—about two out of three of the adult population, and roughly the same as the number who use the Internet. The RSPB boasts well over one million members; television programmes featuring British birds regularly top the ratings on terrestrial channels; while the number of bird books has increased exponentially, with hundreds of titles now published each year.

If one event can be said to epitomise the popularity of birding—not just in Britain but throughout the world—it is the British Birdwatching Fair. Described as "a cross between the Chelsea Flower Show and the Glastonbury Music Festival" **[4]**, the Birdfair is held annually, on a site alongside Rutland Water in the heart of the English countryside.

Since it first began in the late 1980s, the Birdfair has grown into the biggest event in the British birding calendar. Vast marquees house hundreds of exhibitors, selling all manner of birding products and services ranging from optics to books and clothing to exotic foreign holidays. Thousands of people attend the three-day event, coming from all over the world to make the Birdfair truly global in scope. Most importantly, at a

time when bird populations and habitats are under threat everywhere, the Birdfair has donated over £1·5 million to global bird conservation projects, making a significant impact on the welfare of birds.

The original Birdfair has, thanks to the efforts of its founders, spawned a number of similar events around the world: in places such as the Netherlands, Israel, India, Taiwan and Australia, as well as many state-based events around the US. Each event helps to encourage birding and conservation in the country where it takes place; and each, too, forms another link in the rapidly growing global birding network.

This is the most significant aspect of the Birdfair: that it provides a central, physical meeting place for the global birding community. Of course not everyone can attend; but at some time or another, a significant proportion of the key people in the birding world do so. Writers, artists, tour leaders, business people, identification experts, publishers, conservationists and amateur enthusiasts can meet each other, exchange ideas, discuss projects, and in doing so help to strengthen and develop birding as a truly global activity.

Elsewhere in the world, birding is thriving as never before:

- In Australia, Sean Dooley's book *The Big Twitch* **[5]**—an account of the author's successful attempt to break the Australian 'Big Year' record—became an unexpected bestseller, turning the young birder and comedy writer into a national celebrity.
- Off the coast of California, Debi Shearwater (a woman who loves seabirds so much she changed her name to one!) runs a series of offshore boat trips, known as 'pelagics', allowing birders from all over North America and beyond to see rare and elusive seabirds **[6]**.
- In October 2004, the 7th annual Turkish Bird Conference was held in Izmir, on the edge of the Aegean Sea. Unlike similar conferences held in Britain and the US, most of the birders who attended were under 30 years old, and about one in three were women.
- The Internet now hosts many 'bird forums', where birders can discuss sightings, exchange news and views, etc. One such example is that of the Nature Society (Singapore) **[7]**.
- Conservationists around the world, often aided by local and visiting birders, have saved at least 31 species from extinction during the past three decades. Birds brought back from the brink include Mauritius Kestrel (*Falco punctatus*), Chatham Island Robin or Black Robin *(Petroica traversi*) and California Condor (*Gymnogyps californianus*).
- Bird tours, mainly run by companies based in Britain and the US, continue to visit virtually every country and region of the world, where by employing local guides and using local facilities they make a significant contribution to national and regional economies.
- In Britain, birding is one of a range of 'life skills' (also including cookery and financial literacy) which are set to become part of the school curriculum for children aged from eleven to 14, in an attempt to combat disaffection and social problems.

From this eclectic list, it can be seen that birding is no longer simply a pleasant and enjoyable hobby, practised in isolation from the rest of society. Arguably it never was: birding and changes in society have always gone hand-in-hand, and Max Nicholson, amongst others, commented on the 'classless' nature of birding as long ago as the 1920s.

But today, as never before, birding is becoming incorporated into a much broader range of activities and lifestyles. This is largely, I believe, because of the nature of modern society, in which the old boundaries between social classes, activities and ways of living are breaking down.

Before I examine the wider implications of this change on birding, in the next section I shall briefly survey the ways in which birding and society developed during the 20th century.

Part 2: Birding Past

> *Birdwatching is not only an intense aesthetic experience, but also a stimulus to the mind and to the imagination, as one tries to understand the nature of a bird's world.* **[1]**
>
> H. G. Alexander, 1974

The contrast between the global, multi-faceted and pluralist way in which we watch birds today, and the fragmented, insular and parochial nature of birdwatching which prevailed during most of the 20th century, could hardly be greater. At least until the 1980s, which saw a sea-change in the way we watch birds (mainly, though not exclusively, due to changes in communications, technology and travel), birdwatching remained the preserve of a relatively closed community of like-minded souls. Even as recently as the 1970s, the pastime was largely confined to white, educated males, almost all of whom lived in the English-speaking world.

A generation ago birdwatchers relied on a handful of identification books, mainly illustrated by the great American bird artist Roger Tory Peterson. They used fairly basic optical equipment: a pair of old-fashioned 'Porro-prism' binoculars, whose design had remained virtually unchanged since the First World War, and rarely carried telescopes, which were primitive in design and difficult to use.

Feeding garden or backyard birds was limited to putting out a few kitchen scraps or peanuts onto a bird table, while going abroad to watch birds was still in its infancy. Most Britons never even crossed the English Channel, and even the most intrepid travellers rarely ventured beyond the boundaries of Europe. In the US, birders did travel within the lower 48 states, but few went much farther afield.

Half a century before that, in a world recovering from the devastation of the First World War, birdwatching was even less significant. When a young man named Max Nicholson went up to Oxford in the early 1920s, his fellow students were more interested in hedonism and drunken japes than in wholesome, outdoor pursuits such as watching birds. Despite the lack of interest amongst his peers, Nicholson joined the embryonic Oxford Ornithological Society, and went on to become the most influential figure in the development of birdwatching in Britain before his death in 2003 at the age of 98.

During his lifetime, Max Nicholson witnessed the many social changes that together created the world of birding we know today; a process—or series of processes—which I document in this chapter.

The 'invention' of birdwatching

Human beings have been aware of birds—from a religious, cultural and often practical point of view—since civilisation began. Peoples as varied as the Aztecs of Mexico, the ancient civilisations of the Far East, and the indigenous peoples of Australia, all had birds at a central place in their culture.

But there is a world of difference between these ways of looking at birds—the cave-paintings made by prehistoric European hunters, the early quasi-scientific studies by men like Aristotle and Pliny, and the wealth of folklore associated with birds in all the world's cultures—and the leisure activity we now call birdwatching or birding. Indeed, the very term 'birdwatching' is a coinage barely a century old.

In 1901, 'bird watching' appeared in print for the very first time, as the title of a book **[2]** by British naturalist Edmund Selous. Selous himself was something of a recluse, living in the shadow of his more famous brother, the big game hunter F. C. Selous. In some ways he typified a public image of the birdwatcher as a solitary eccentric; an image that persisted until at least the end of the 20th century, and lingers on in some places even today.

At the time Selous's book was published, birdwatching was struggling to emerge from the influences of scientific ornithology and collecting. Both Britain and the United States had a long history of both disciplines, going back at least to the 18th century, and arguably even earlier.

Indeed the two were inextricably intertwined: most early ornithologists were also 'collectors', at least in the sense that they either shot birds themselves, or sent someone else to obtain specimens for them. This was not the blood-lust it has often been depicted: in the main, the collectors of the 18th and 19th century were serious men

(and the occasional woman) pursuing a genuine interest in extending the frontiers of scientific knowledge **[3]**.

What Max Nicholson called "the Victorian leprosy of collecting" did have its downside: although it greatly increased our understanding of subjects such as bird classification, distribution and plumage details, it also created a climate where field observation was for long regarded as a second-class substitute for studying a bird in the hand—summed up in the oft-quoted mantra, "What's hit is History, what's missed is Mystery".

Yet there is no doubt that between them, the museum-based ornithologists and field collectors laid the foundations for the unprecedented development, during the 20th century, of birding as a leisure activity. One example is Elliott Coues (1842–1899), author of the *Key to North American Birds* (1872) **[4]**, which ran to four editions, and was later published in Britain as the *Handbook of Field and General Ornithology* (1890) **[5]**.

Coues's approach can be summed up in a quote from that work: "How many birds of the same kind do you want? All you can get". As a committed collector, Coues may appear to have little in common with the birders who came to prominence in the following generation, yet he was one of the three founders of the influential American Ornithologists' Union (AOU) and editor of its quarterly journal, *The Auk*. Moreover, his unbounded enthusiasm for the pursuit of birds was not very different—in both the impulse behind it and the determination with which it was pursued—from the modern twitching ethos.

The gradual shift between collecting and birding is personified in the life and career of one of Elliott Coues's disciples, Frank Chapman (1864–1945). Although Chapman learnt about birds primarily through collecting expeditions (even taking his wife collecting on their honeymoon!) he later found fame as a campaigner for the protection of wild birds.

As well as writing a number of popular bird books, in 1899 he founded *Bird-Lore*, the official magazine of the Audubon movement; a publication which perhaps did more than any other to stimulate and encourage the new-found hobby of birding.

Another driving force behind this new and more benevolent approach to birds had come from a campaign, in both the US and Britain, against the use of bird feathers and skins in women's fashion. Led mainly by women—mostly from the upper echelons of society—this resulted in the founding of the National Audubon Society in 1886 (and soon afterwards the various local Audubon chapters), and the Society for the Protection of Birds (later the RSPB) in 1889. In the following century these two organisations would have a major impact on the numbers of people taking up birding as a pastime.

Soon afterwards, similar bird protection groups would emerge elsewhere, such as La Ligue pour la Protection des Oiseaux (LPO), founded in France in 1912; Aves Argentinas, founded in Buenos Aires in 1916; and the Royal Forest and Bird Protection Society, founded in New Zealand in 1923.

A further impetus to the new hobby came from a revolution in optics. In 1854, the Italian inventor Ignatio Porro had registered a patent for an optical system using prisms; the forerunner of compact binoculars and telescopes we use today. Forty years later, in 1894, the German firm Carl Zeiss brought out the first truly effective pair of prismatic binoculars, following Porro's original design. By the first decade of the 20th century this type of binoculars—virtually identical to the kind many birders still use today—had become widely available.

So by 1901, when Edmund Selous's book *Bird Watching* was published, the scene was set for a new, more benign way of studying birds—using an optical lens to watch them, rather than a double-barrelled shotgun to kill them. A new era—during which birdwatching would develop many of the characteristics by which we know it today—was about to begin.

The early years of birdwatching: 1900–1939

On Christmas Day, 1900, 27 observers—led by the new editor of *Bird-Lore*, Frank Chapman—took part in the very first Christmas Bird Count in the US. From its humble beginnings, this has since become a national institution, with more than 50,000 people now taking part in over 2000 separate counts from Alaska to Hawaii and from Florida to California, as teams compete to record the greatest number and variety of birds in their local area.

In Britain, too, 'listing'—so characteristic of the sporting side of birdwatching—was also taking root. Pioneering birder H. G. Alexander and his brother Christopher were the first to document the practice near their home in Kent on New Year's Day 1905; with H. G. continuing until his death in Philadelphia, in 1989, in his 101st year.

Other aspects of modern birding which either began, or became established practice, in the first two decades of the 20th century were bird ringing (known in North America as 'banding'), migration studies, and close observation of breeding bird behaviour.

The first official ringing scheme began in Britain in 1909, coincidentally the very same year that banding began in North America. Migration studies had begun with Heinrich Gatke's visits to the German island of Helgoland in the mid-19th century, but it was the work of English ornithologist William Eagle Clarke and his followers on Fair Isle, from 1905 onwards, that finally solved so many mysteries about the origin and appearance of migrating birds.

Soon afterwards, British birdwatchers turned their attention to breeding birds: studies of warblers (Sylviidae) and the Common Moorhen (*Gallinula chloropus*) by Eliot Howard, the Great Crested Grebe (*Podiceps cristatus*) by Julian Huxley, and of the Common Cuckoo (*Cuculus canorus*) by Edgar Chance, revealed extraordinary secrets about common—and previously largely ignored—birds.

With the establishment of *Bird-Lore* in the US in 1899, and *British Birds*, founded by H. F. Witherby in 1907, the stage was set for a boom in birding as a popular pastime. Birdwatching was by now becoming popular amongst all walks of life, including the very top: as revealed when, one fine morning in June 1910, former US President Theodore Roosevelt and British Foreign Secretary Edward Grey went for a day's birdwatching in rural Hampshire. Four years later, in August 1914, the progress of the pastime—and indeed many other aspects of normal life—came to an abrupt halt, with the start of the First World War.

In many ways the Great War stopped the development of birdwatching in its tracks; not least because it killed so many promising young ornithologists and birdwatchers. But in other ways it had a profound and lasting effect on the way in which birdwatching would develop during the years between the end of the conflict in 1918 and the start of the Second World War in 1939. These years would see another surge in the popularity of watching birds for pleasure, on both sides of the Atlantic and throughout the British Empire.

The key factors which shaped the development of birdwatching during the 21 years between the two world wars were very much the product of that remarkable era. This was a time of global uncertainty, during which the horror of the legacy of war, then worldwide economic depression, and finally the impending onset of a new conflict, created a very different world from the essentially stable society of the 19th and early 20th centuries.

In addition, technological changes—especially in the fields of transport, optical equipment and publishing—all had an impact on birding, by providing access to birdwatching sites, better quality binoculars and the first truly portable bird identification books. Finding, watching and identifying birds—at least if your income permitted—had never been easier.

In 1934, a young American bird artist named Roger Tory Peterson published his original *A Field Guide to the Birds* **[6]**, which has since sold more than three million copies. This book encouraged millions of Americans to take up the pastime by providing them with the means to identify the birds they saw.

The original Peterson guide is, by today's standards, a somewhat modest volume, with a brief text and a series of rather formalised plates depicting the birds of the eastern US. The revolutionary aspect of this work, however, was not the content—there had been field guides before—but Peterson's approach. He depicted families of birds in stylised positions, with arrows showing key field marks, allowing direct comparison between similar species. It proved a winning formula, and today Peterson guides are still available for a myriad of subjects, from clouds to beetles and mammals to urban wildlife.

Peterson was not just a great bird artist, but an active birder, encouraging major advances in field identification (rare birds no longer needed to be shot to prove their identity) and our knowledge of North American birds as a whole. The breadth of his influence on birding in North America was summed up by his old friend Elliott Richardson, in 1977:

> It has been said that... Roger Tory Peterson has done more than any other person to make the field identification of birds a science. I am sure that is true. But it is fair to say that Roger Tory Peterson has also done more than any other man to make field identification a sport. **[7]**

On May 19, 1984, at the age of 75, he was still fit and keen enough to take part in an event which sums up his legacy, the first annual World Series of Birding, a race to see

as many different species as possible in 24 hours, held in the state of New Jersey. And yes, with a total of 201 species, Peterson's team won!

Despite the lack of a decent field guide to British birds until after the Second World War, birding continued to develop in Britain. It did so largely under the guidance of a handful of gifted, dedicated and far-sighted individuals.

The 'godfather' of British birding was H. F. (Harry Forbes) Witherby, who, on top of founding *British Birds* two years earlier, started the official bird ringing scheme in 1909, and was to be the main editor of the seminal *The Handbook of British Birds* **[8]**, published in five volumes from 1938 to 1941, which had a profound and lasting influence on generations of birdwatchers for several decades afterwards.

His trusty *consigliere* was Bernard Tucker, an early member of the Oxford Ornithological Society, who collaborated with Witherby on the *Handbook* before his untimely death in 1950, aged just 49. Then there was the charismatic, mercurial polymath Tom Harrisson, who instigated the earliest bird surveys, later using what he had learned about observing birds to study the ordinary lives of people, in the Mass-Observation movement of the 1930s.

But the key figure, not just between the wars but well beyond, was Max Nicholson. During a long and distinguished career this extraordinary man either founded or ran most of the key ornithological and conservation organisations in Britain today, including the British Trust for Ornithology (BTO), the Edward Grey Institute at the University of Oxford, the Nature Conservancy Council (now part of Natural England) and the World Wildlife Fund (now the World Wide Fund For Nature). He was that rare being, a practical visionary, able to envisage the future and work to bring it about. And like Peterson, he was also a keen and active birdwatcher, whose view of birding encompassed not only the scientific and competitive aspects of the pastime, but the spiritual ones as well, as the quotation at the top of this essay shows.

Between them, these men took birding by the scruff of the neck, shook off the baggage left over from the Victorian and Edwardian eras, and embraced a new, modern and scientific approach to the observation, study and recording of birds. Without them, it is unlikely that birding would ever have developed into the global, mass-participation and multi-faceted activity of today.

What allowed all this to happen, more or less simultaneously, in Britain and the US, was that a major social shift was taking place; one which would have a profound impact not just on birdwatching, but on hobbies and interests in general. This was the much greater availability of leisure time—no longer just for the monied classes, but for more or less everybody.

As American sociologist Steven M. Gelber has shown **[9]**, by 1920 industrial workers in the US had eight hours more 'free time' per week than their counterparts in 1900. As a result, the concept of having one or more 'hobbies' arose for the first time. The combination of increased leisure time and the need to fill it (driven, presumably, by the Protestant work-ethic that dominated US and British society) led to a major upsurge in what became known as leisure activities, of which birding was just one.

By the end of this period, at the start of the Second World War, George Orwell was able to gently mock his compatriots' addiction to hobbies:

> Another English characteristic which is so much a part of us that we barely notice it, and that is the addiction to hobbies and spare time occupations… We are a nation of flower-lovers, but also a nation of stamp-collectors, pigeon-fanciers, amateur carpenters, coupon-snippers, darts-players, crossword-puzzle fans… **[10]**

To which he could, of course, have added 'birdwatchers'. By the start of the Second World War birdwatching had become a socially acceptable and reasonably widespread leisure activity both in Britain and the US. And although it might be imagined that another major global conflict would once again stop the progress of the pastime in its tracks, strangely the very opposite was the case.

War, peace and the birdwatching boom: 1939–1975

Unlike the First World War, which effectively set the progress of birdwatching as a pastime back at least a decade, the Second World War appears to have had a quite different effect.

Many keen young birdwatchers in Britain and North America found themselves posted abroad—for the vast majority, this was the very first time in their lives they had ever left their home country. Moreover, the arenas of conflict were far wider than

in any previous war, including North Africa, the Middle East, India, the Far East and the Pacific, giving birdwatchers—and potential birdwatchers—access to exotic habitats and species beyond their wildest dreams.

There is clear evidence that many people took the opportunity of being posted abroad to extend their interest in watching birds. As has often been said, war consists of 5% fear and excitement, and 95% boredom; and if that is the case, then birdwatching certainly provided at least something of an antidote.

What are perhaps the most fascinating accounts of wartime birdwatching come from a single prisoner-of-war camp, Eichstätt in Bavaria. Here, three men who were later to have a distinguished career in the British ornithological establishment—John Buxton, Peter Conder and George Waterston—all used their enforced 'leisure time' to make detailed studies of the local birds. After the war, Buxton published his findings in one of the early Collins New Naturalist monographs, *The Redstart* **[11]**.

But the real legacy of the Second World War was the way in which it broadened people's horizons, and clarified their needs, wishes and desires. Whether or not one was posted abroad or forced to spend years confined to a restricted local neighbourhood, the desire following the ending of hostilities was the same: to make the most of one's life.

This manifested itself in a hunger for education; a keenness to explore one's own country and, if possible, the world; and what Sir Dudley Stamp, writing almost a quarter century after the end of the war in 1969, called "the satisfaction of the less obvious demands of the spirit" **[12]**.

In the decade or so following 1945, birdwatching underwent a major rise in popularity and participation on both sides of the Atlantic. Better—and cheaper—optics, and the first comprehensive field guides (including Roger Tory Peterson's co-operation with two British ornithologists, Guy Mountfort and Philip Hollom, to produce *A Field Guide to the Birds of Britain and Europe* **[13]**, in 1954) allowed tens of thousands of people to take up birdwatching for the very first time.

From 1950, petrol was no longer rationed in Britain, while in the oil-rich, gas-guzzling US it had never even been contemplated; allowing birders on both sides of the Atlantic to travel further afield in search of their quarry. Access to the British countryside was also made much easier than it had been before the war.

The war brought another, unexpected side-benefit: the use of radar—originally, of course, a military invention—to track the journeys of migrating birds. The 1950s saw a boom in migration studies, as observatories opened on remote islands and headlands all round the coasts of Britain and Ireland.

During the late 1950s and early 1960s, as restrictions on foreign travel were gradually removed, British birdwatchers headed abroad on organised expeditions or private holidays in much greater numbers than before. Others were forced to do so: compulsory National Service continued in Britain until the early 1960s, with many young men spending two years in far-flung corners of the British Empire. Like their Victorian predecessors, some of them forsook the temptations of women and strong drink and spent their spare time watching birds.

In North America, once again Roger Tory Peterson was at the forefront of encouraging people to take up birding, and giving established birders the impetus to broaden their horizons beyond their immediate neighbourhood, county or state.

In 1953, Peterson and his British counterpart James Fisher travelled the length and breadth of North America north of the Rio Grande, racking up 30,000 miles in just 100 days, and seeing 572 species along the way—at the time a record annual total. The book and film of the journey, *Wild America* **[14]**, were both released in 1955, to great popular and critical acclaim. Suddenly, it seemed, there was no limit to the distances a keen birder might travel in pursuit of North America's birds.

In the following two decades, the sporting nature of birding—largely suppressed since the days of the Victorian collectors—really took hold. The Christmas Bird Count hugely increased in popularity, while North American listers competed to be the first person to break the 600 species barrier in a single calendar year.

This landmark had almost been reached by Englishman Stuart Keith in 1956 (598 species), and amongst birders had gained iconic status, rather like breaking the four-minute mile or the sound barrier. After several people had tried and failed, the 600 mark was finally shattered in 1971, when an 18-year-old college student from Pennsylvania named Ted Parker saw a staggering total of 626 species.

As the number of birders on both sides of the Atlantic grew, so a kind of 'positive feedback loop' was established. The more birders there were in a particular community, the more people they were likely to recruit to their interest, in turn spreading the word amongst non-birders.

Birding has always suffered from something of a poor image amongst the general public, with derogatory terms such as 'anoraks', 'nerds' and the more creative 'organic trainspotters' being used to describe its adherents. But from the 1960s onwards, there was strength in numbers: a kid at school or starting college, or someone changing jobs or moving into a new neighbourhood, was likely to simply bump into fellow enthusiasts at local birding sites, or be given details of 'a friend of a friend' who was a birdwatcher **[15]**.

Bird-finding guides were also beginning to be published, pioneered by Olin S. Pettingill in the US, whose ground-breaking *A Guide to Bird Finding East of the Mississippi* **[16]** appeared in 1951. Once again, Britain soon followed the American example, with John Gooders' *Where to Watch Birds* **[17]** first published in 1967, and rapidly becoming a best-seller.

As horizons broadened, so the opportunity to travel farther afield arose, thanks to the widespread ability of cheap 'package tours' from the mid-1960s onwards. By a convenient coincidence, many of the destinations for these trips were also excellent places to watch birds.

So, as the package holiday phenomenon took off, British birders headed beyond their nation's shores, many for the first time. The most popular destinations were the Mediterranean island of Mallorca, and the Spanish Costas, soon followed by the Algarve in Portugal, and islands in the eastern Mediterranean such as Cyprus, Crete and Rhodes.

In the US, the increased popularity of Florida as a cheap holiday destination also attracted millions of visitors—not just from within North America, but also from Europe, especially the UK. Perhaps because of the relatively recent development of the state, Florida's birds are exceptionally approachable—so much so that early visitors to Walt Disney World often assumed that they were looking at captive rather than wild birds!

Meanwhile, in various parts of the globe national birding and bird protection organisations were being set up, such as La Lega Italiana Protezione Uccelli (LIPU) in Italy, founded in 1965; and the Hong Kong Bird Watching Society, founded in 1957. These joined the more established organisations such as the Bombay Natural History Society, a 19th century foundation, to provide a focus for birders in their respective countries to meet, socialise and exchange information.

Birding joins the mainstream: 1975–2000

During the period from the mid-1970s to the turn of the new millennium, birding underwent a series of important changes, including:

- The use of surveys, initiated by professional scientists but largely carried out by amateur birders, to highlight changes in population and range of the birds of a particular country or region.
- A revolution in communications, from an informal telephone 'grapevine', via premium rate phone information lines and portable pagers, to the widespread use of the Internet.
- A great improvement in the standard of optical aids; and a parallel boom in bird books, especially field guides.
- A much broader information base, firstly via books (especially site guides) and later using the Internet.
- A major increase in travel to watch birds, leading to a global network of birding areas, sites and local guides, and the huge growth in the desire to see rare birds—resulting in a boom in national twitching and, for a rich minority, world listing.
- In the latter part of this period, a broadening of the demographic base of birding, to become more socially inclusive than before.

Looking back just a single generation, to the early 1970s, it is clear that much of this could never have been predicted. Nevertheless, the seeds of this phenomenal growth and change were already being sown; and with hindsight we can analyse how these changes came about.

Surveys

Although formal bird surveys had been carried out in Britain since the late 1920s—and indeed could be said to have begun with a survey of spring migrants carried out by the Finnish professor Johannes Leche as early as 1749 **[18]**—the very first comprehensive attempt to document the distribution of an entire breeding avifauna did not take place

until the late 1960s. The original *Atlas* survey **[19]**, carried out by the BTO and the Irish Wildbird Conservancy, was very much the triumph of hope over experience.

The organisers, many of whom had serious doubts about the success of the enterprise, had underestimated the sheer dedication of the 10,000 or so amateur fieldworkers, who between them covered almost 4000 10-kilometre squares and produced more than a quarter of a million records of over 200 breeding bird species. As in the 1930s, when the BTO's earliest surveys of single species had been carried out, the end result was that birding, conservation and science joined forces to create something much greater than the sum of the parts.

During the subsequent decades, the *Atlas* format was successfully duplicated all over the world, with national and regional surveys of breeding, wintering and migratory birds appearing by the dozen. Each had the welcome by-product of giving thousands of ordinary birdwatchers a sense of purpose and collective achievement in what has become known as 'Citizen Science' (see Part 3).

The communications revolution: twitching and world listing

As recently as the 1950s and early 1960s, if a rare bird was sighted in Britain, the finder would often communicate the news to his fellow birdwatchers by sending them a postcard! By the 1970s, almost every home had a telephone, and as a result rare bird enthusiasts organised informal 'grapevines'—networks of people who would telephone each other to pass on the news of a rarity. The instantaneous nature of this new form of communication gave rise to the twitching boom of the 1970s and 1980s, during which time groups of like-minded enthusiasts travelled hundreds of miles every weekend to add vagrant birds to their 'British List'.

But the domestic telephone had one major drawback: it was not portable. Then, in the mid-1980s, a revolution in communications created three new ways of obtaining information about rare birds while out in the field.

First, the premium-rate telephone information line, by which twitchers could dial up to get up-to-the-minute news of a rare bird. Second, the portable pager—a device originally designed to alert medical staff about an emergency—was appropriated to send rare bird information, some of which could be personalised to the individual recipient. Finally, the widespread availability of mobile telephones allowed instant communication between fellow birders.

The impact of these new technologies on the way in which birding developed during this period was immense. It is hard to imagine that twitching would have become quite so popular with so many people if the means by which the latest news of a rare bird's arrival—or just as important, its departure—had not been available.

At its height, in the 1990s, twitchers vied with each other to travel ludicrously long distances—and spend even more ludicrous amounts of money—to see a single rare bird. Return trips from the Isles of Scilly to Shetland, costing hundreds of pounds and involving the chartering of a private aircraft, were not uncommon during this period.

In North America and Australia, the far longer distances involved led to even more bizarre stories, many of which have been documented for posterity in books such as Mark Obmascik's *The Big Year* **[20]** (a gripping account of a three-way attempt on the North American record for the number of species seen in a calendar year), and Sean Dooley's *The Big Twitch* **[21]**, a similar story of individual persistence in Australia.

But for truly epic stories of human endeavour, we must look to a tiny sub-group of truly obsessive individuals: those who spend their lives—and copious amounts of money—pursuing the ultimate goal of the global birder, the 'world list'.

World listing is the logical consequence of the habit of most birders of keeping a record of the different species they see. Until the late 20th century, before frequent foreign travel became the norm rather than the exception, most birders kept a series of lists ranging from the birds seen in their garden or backyard, via a list of those seen in a particular county or state, to their national list, of all the species seen in the wild in their home country (or in the case of many North American birders, their continent north of the Mexican border).

From the 1960s onwards, an elite group of well-travelled birders (mostly professional bird tour guides or international businessmen) began to tally their world list. At the time, only a tiny minority had seen over 2000 of the then estimate of about 8600 species; and just two or three could boast a list of over 3000 species. In 1973, expatriate British birder Stuart Keith, by then based in New York, became the very first person to see 4300 species—half the world total, then considered a seemingly unassailable achievement.

But as global air travel became cheaper and more accessible, and the incomes of the very rich rose exponentially, so a new breed of global birders emerged. Some were top birders themselves; others simply paid local experts to find their birds for them. By the end of the century a handful of these obsessive travellers had reached the 8000 mark (though by then, because of advances in taxonomic knowledge, the total number of species was nearing 10,000).

The best-known of all the world birders was the American heiress Phoebe Snetsinger, who tallied an incredible 8400 species. Having won a long battle against apparently terminal cancer, as told in her posthumously published autobiography *Birding on Borrowed Time* **[22]**, it was ironic that Snetsinger died in a freak road accident while birding in Madagascar, in 1999.

The technological and communications revolutions: optics, books and the Internet

For the ordinary birder, such feats of global listing were very far from their normal experience. Nevertheless, the wider aspects of the technological and communications revolutions had an important affect on their chosen pastime too.

Perhaps most important was the massive improvement in optics during this period. Back in the early 1970s, the binoculars used by most birders had hardly changed since the Second World War, and the use of telescopes was confined to a hard core of serious enthusiasts. Less than two decades later, it seemed that virtually every birder in the developed world was sporting a pair of high-specification, roof-prism binoculars made by one of the leading manufacturers such as Zeiss, Leica or Swarovski. Even at the lower end of the market, standards had improved radically, with excellent optics available for less than £150 in Britain or below US$200 in the US. The rapid turnover rate as birders vied with each other to sport the latest models had an unexpected knock-on effect to birding in the developing world, as travelling birders began to donate their old (but perfectly workable) models to local guides.

Telescope technology also advanced by leaps and bounds during this period. The old draw-tube brass instruments had been consigned to history, to be replaced by telescopes of astonishing quality, using the latest in optical technology to allow birders to see plumage detail they could only have imagined previously.

During the same period, the number of bird books—especially field guides—increased exponentially. Today, modern, well-researched and up-to-date field guides are available for virtually every region in the world; a result of a combination of greater ease of travel and the improvement in optics which has allowed the authors and artists to study their subjects in forensic detail in the field.

This culminated in the appearance of a definitive series of volumes, one of which you are currently reading. The first volume of the *Handbook of the Birds of the World* **[23]**, covering the ratites to wildfowl, appeared in 1992, and the publishers have achieved a commendable strike rate since then, with the sixteenth and final volume due to appear in autumn 2011. The standards achieved—in research, writing, photography and illustration—have been quite phenomenal, with reviewers running out of superlatives to describe each new volume. The series has not only provided ornithologists and amateur birders with an indispensable reference tool, but is also contributing to our understanding and conservation of some of the world's rarest and most endangered species.

Site guides have also enjoyed a boom, with books covering most of the world's regions, including a recent guide—aimed largely at regular business travellers—to watching birds in and around more than 60 of the world's major cities, from Addis Ababa to Zurich **[24]**.

But for information on where to find, see and watch birds, most birders now log onto the World Wide Web, where up-to-date information written by birders for their fellow enthusiasts can be downloaded in a matter of seconds, obviating the need to spend time and money tracking down a book. This is, of course, just one aspect of the impact of the Internet, which I shall examine in Part 3 of this essay.

Birding in the developing world

In those parts of the world which had once been ruled by the British, under the Empire "on which the sun never set", expatriate and local birders were building on the legacy of the departed colonial administrators. In former colonies such as India, Hong Kong and Singapore birding continued to thrive, supported by organisations such as the Bombay Natural History Society, the Hong Kong Bird Watching Society and the Malayan Nature Society, whose very names reflect their colonial past.

In most cases expatriate Britishers dominated, including British servicemen and business people based abroad. In Singapore, the withdrawal of British forces in 1971

led to a major downturn in membership of the local nature society; but from the 1980s onwards birding began to boom again, as ornithologist Lim Kim Seng has noted:

> The 1980s through to the end of the 1990s marked a period of phenomenal growth in interest in birding. This was the result of the Malayan Nature Society's very active Bird Group, which increased its monthly birding trips to twice a month, initiated an annual bird race and started involving members and the public in bird censuses... Membership grew more than six-fold from 300 in 1980 to over 2000 by 1999, by which time the MNS had changed its name to better reflect its objectives to Nature Society (Singapore). **[25]**

Elsewhere in the world, too, birding has made rapid progress. In a chapter written for the new book, *The Birds of Turkey* **[26]**, British ornithologist and expert on the birds of the Middle East Richard Porter lays out the recent, but quickly developing, history of Turkish ornithology. In a personal note he describes the major changes that have taken place since his first visit to the country in the late 1960s:

> In October 2004 I attended the 7th Turkish Bird Conference, which has now become an annual event. It was held in Izmir, on the edge of the Aegean, with two days of talks followed by two days of trips to marsh and mountain.
>
> I gave a talk on Turkey in the 1960s, when I first visited the country there was just one, or possibly two, birdwatchers. In 2004, there were over 150 Turkish birders at the talks, and on the outings even more...
>
> Most of the birdwatchers at the conference were under 30 (and about one-third were female). Compare this with the mix at the annual BTO conference! At the last one I attended, two years ago, there was hardly anyone below 30...
>
> I happened to ask a young girl, who was active in conservation, what changes she would like to see to help wildlife in Turkey. Her reply? "I wish we were all 20 years older—then decision-makers would take our views more seriously." The good thing is they will be one day. **[27]**

The changes witnessed by Porter in a single generation in Turkey have been replicated throughout the developing world. A felicitous combination of visiting birders from Europe and North America, and the efforts of local birders, has led to extraordinary progress.

Other examples include Israel, a favourite destination for British and Scandinavian birders since the early 1980s, where in 1996 the young ornithologist Hadoram Shirihai produced a monumental book, *The Birds of Israel* **[28]**, a comprehensive avifauna of breeding, wintering, migrant and vagrant birds which matched anything published for more developed nations. Shirihai acknowledged the debt of previous writers on the birds of the Middle East, going back to the anonymous authors of the Old Testament, who had made some of the earliest ever written observations of birds.

Birding in the Middle East developed rapidly during the 1980s and 1990s, thanks partly to talented and committed individuals such as Shirihai, and partly to the support and expertise of visiting birders—including those from the new birding hotspots of Scandinavia and the Netherlands. This relationship was formalised by the founding, in 1978, of the Ornithological Society of the Middle East (OSME), the successor to the Ornithological Society of Turkey. Today this thriving society has expanded to include the Caucasus and Central Asia as well as its more traditional region.

OSME was swiftly followed by the Oriental Bird Club (OBC) in the mid-1980s, and the Neotropical Bird Club (NBC) and African Bird Club (ABC) in the mid-1990s. Given the long tradition of British interest in these regions, it is hardly surprising that all these organisations originated in the United Kingdom, and were, initially at least, largely run by British birders; though there was also an active network of country representatives. As membership expanded to reflect international interest in these regions, so the focus of the bird clubs broadened too: with the OBC holding meetings in the Netherlands, Sweden, Denmark and Malaysia.

Much of the work of the bird clubs has been focused on the conservation of key habitats and species: such as Gurney's Pitta (*Pitta gurneyi*) in Thailand and Myanmar, Cerulean Warbler (*Dendroica cerulea*) in the Americas, and Congo Peafowl (*Afropavo congensis*) in Africa. Money is raised via sponsors and events, and grants and bursaries are given to conservation organisations and individuals within the region.

The rise of the bird clubs has gone hand in hand with two other factors. On the positive side, the period also saw a massive growth in birding tourism, with specialised trips now taking birders to visit virtually every part of the world.

More worryingly, the period has also seen two negative factors emerge: the rapid decline of many rare and endangered bird species; and the growth in global political

(and now economic) instability that has accompanied (and in many cases, helped to cause) these declines.

The role of the bird clubs in alerting governments and other organisations to problems and potential disasters is now crucial; fortunately the individuals involved in the clubs are often also working for BirdLife International and/or national conservation organisations **[29]**.

Part 3: Birding Present

> *There has been a tremendous renaissance in nature study in recent years; it has been called a form of escapism, and perhaps it is in a way, but not an escape from reality; but rather, a return to reality.* **[1]**
>
> Roger Tory Peterson, 1957

In this section I examine and analyse the current global birding 'scene' from a thematic, rather than historical, point of view. This inevitably leads to some overlap, but so it should: none of the subjects covered here exists in isolation, and all impinge, to a greater or lesser extent, on each other.

The subject areas I have chosen to cover are:

- **Who watches birds?** Using a combination of statistical surveys (where they exist), and anecdotal evidence (where they do not) I have examined the demographics of birding in the developed and developing world. I also look at the ways birding relates to specific groups in society, such as women, ethnic minorities, gay and disabled people.
- **Birding, ornithology and conservation**. How birding continues to interact with the scientific discipline of ornithology, with both groups gaining strength and depth from this relationship. This includes atlases and surveys, 'Citizen Science' projects, global and local conservation work, and how new developments in science (notably techniques to analyse the DNA of living creatures) are changing the way we watch and think about birds.
- **Birding and the media**. How television, radio and newspapers report birding stories.
- **New technology**. How the most recent developments in technology, including palmtop PCs, mobile phones and the Internet, are affecting the way we watch birds.
- **The economic importance of birding**. How birding contributes to local, regional and national economies, through expenditure on travel, equipment, etc., job-creation, taxes and overall economic benefits.

Who watches birds?

At the start of the Second World War, British ornithologist James Fisher made a random list of the people he knew who enjoyed watching birds:

> Among those I know of are a Prime Minister, a President, three Secretaries of State, a charwoman, two policemen, two Kings, two Royal Dukes, one Prince, one Princess, a Communist, seven Labour, one Liberal, and six Conservative Members of Parliament, several farm-labourers earning ninety shillings a week, a rich man who earns two or three times that amount in every hour of the day, at least forty-six schoolmasters, an engine-driver, a postman, and an upholsterer. **[2]**

Apart from the rather dated language used, a similar list could easily be compiled today. What both would show is that birding is by no means confined to a single social class. In an era when Western societies, at least, appear to be fragmenting into ever-narrower special interest sectors, birding is refreshingly eclectic in its participants.

Certain groups have always been prominent, however. Politician-birders have a long pedigree, going back as far as Teddy Roosevelt and Edward Grey at the turn of the 20th century, and including at least one Prime Minister of the United Kingdom (Sir Alec Douglas-Home, later Lord Home), another US President (Jimmy Carter) and a British Chancellor of the Exchequer (Kenneth Clarke). Maybe it is the relief from the pressures of the offices of state that impels politicians to seek solace in birds!

Royals, too, have taken a keen interest. Prince Philip became so keen on photographing seabirds on his royal voyages that he published a book on the subject, *Birds*

from Britannia **[3]**. Until 2004, Queen Noor of Jordan was the President of Birdlife International, after which the role was taken over by Princess Takamado of Japan. Another Asian royal, Princess Sirindhorn of Thailand, has even had a bird named after her: the White-eyed River Martin, (*Pseudochelidon sirintarae*). Sadly, since its original discovery in 1968 the bird has rarely been seen, and may now be extinct.

While these royal personages may not qualify as 'birders' in many people's eyes, their involvement—and the symbolic value to their subjects—is certainly vital to the continued survival of many of the world's most threatened birds.

Comedians also have a distinguished track-record as birders, and include in their ranks the best-known British birder, Bill Oddie, and the late Eric Morecambe. Rock stars, too, seem particularly attracted: Jarvis Cocker of Pulp, the late Billy Fury, and new bands such as British Sea Power and the Guillemots all profess an interest. And Jim Crace in Britain, Jonathan Franzen in the US and husband-and-wife Graeme Gibson and Margaret Atwood in Canada all seek escape from the solitary life of the writer by going birding.

In fact almost any profession or calling contains at least some birders; perhaps because the impulse to watch birds is, some would argue, as innate as a love of music or art. Even Saddam Hussein, during his final days in captivity, was reported to have saved crumbs from his meals to feed the birds—an echo of the famous story of the 'birdman of Alcatraz'.

On a broader scale, there is, unfortunately, very little information on the demographics of birding. Indeed the only full-scale national surveys are those carried out in the US.

The US Fish & Wildlife Service survey carried out in 2001 **[4]** inevitably produces a broad-brush picture of birding demographics, not least because it includes all those describing themselves as 'wildlife-watchers' and not just birders. Nevertheless, it does reveal some fascinating results, summarised here:

- **Age**: perhaps not surprisingly, birders tend to come from the older age-groups, with the 'participation rate' highest in the 55–64 group (28%, compared with a US average of 22%), closely followed by the 45–54 (26%), 35–44 (24%) and 65 plus (24%) age-groups. The average age for backyard birders was 50, while that of those who took trips away from home to watch birds was slightly younger, at 45.
- **Income**: US birders tend to be better-off, financially, than their non-birding counterparts. The income-groups with the highest percentage of birders were those earning US$75,000 or more per annum (27%); while the lowest percentage were amongst those earning less than US$20,000 per annum (19%). This reflects the fact that while birding is hardly an expensive hobby, compared for instance to skiing or photography, it does require some investment in optical equipment, books and travel. Lower-income groups also tend to have less access to transport such as private cars, and are less likely to use commercial flights, restricting their birding horizons.
- **Education**: US birders also tend to be more educated than non-birders. Here the statistics were even clearer than for income, with the participation rate ranging from 33% for those with five or more years college education, to just 17% for those who only attended high school.
- **Gender**: 54% of those surveyed who described themselves as birders were female, while 46% were male; an interesting contrast to Britain, where the vast majority of active birders are men. However, given that backyard birders make up a high proportion of those surveyed, this figure is perhaps less surprising.
- **Marital status**: A significant majority—72%—of birders are married, while 13% have never married, 9% are divorced or separated, and 7% are widowed. This suggests that birding and marriage are highly compatible, given that the percentage of people married in the US is about 66%.
- **Ethnic and racial distribution**: As the report notes, "Excepting Native American participation, birders are not a racially or ethnically diverse group". Indeed participation rates are dramatically lower in non-white sections of the community: 9% amongst Hispanics, 6% for African Americans, and 6% for those of Asian origin—compared with 24% amongst white Americans and 22% for Native Americans. This is broadly similar with the lack of ethnic diversity amongst birders in the UK, and cannot simply be explained by socio-economic differences between groups. Given that white Americans number roughly 181 million out of the adult population of about 235 million, the figures suggest that there are fewer than four million non-white birders in the US.

Evidence from another source suggests that not only is birding in the US very popular, but that its popularity is growing even faster than other outdoor leisure activities such as hiking, backpacking and snowboarding. The National Survey on Recreation and the Environment **[5]** is a regular snapshot of participation in outdoor activities in the US.

By comparing data from 1983 and 2001, it was found that the number of active birders (defined as those who have watched birds away from their home) increased by more than 230% during the period, and that one in three adult Americans "participated at least at a mild level in outdoor birding at least once in the last year". In absolute terms, the survey suggests that the number of birders has grown from 21 million in 1983, through 54 million in 1995 to over 70 million in 2001. Of these, 28%, or almost 20 million people, can be defined as 'enthusiasts', meaning that they go birding at least 50 times a year.

Although birding is far from the most popular outdoor leisure activity in the US (coming 15th in the survey's 'league table'), the rapid rate of increase in participation means that "birding continues to move toward attaining the status of being among Americans' most-favored activities".

As birding has increased in popularity, so it has gradually started to become more inclusive. The type of people who watch birds has broadened from a base made up largely of men (of all ages and social classes), to include far more women—though even today the vast majority of what could be termed 'professional birders'—writers, artists, photographers, tour-leaders and so on—are still male.

Other social groups have found a voice, too. In Britain, the setting up of the Gay Birders Club in the mid-1990s and the Disabled Birders Association in 2000, indicated that there was a substantial minority of gay and lesbian, or disabled people who enjoyed watching birds. More importantly, it also indicated that some of them, at least, did not feel that their needs and interests were catered for by mainstream birding organisations.

But as Bo Beolens, founder of the Disabled Birders Association, points out, the main problem restricting participation for disabled birders (especially wheelchair users) is not attitudes but access. In his extensive experience of travelling abroad with groups of people with disabilities, the best facilities are at bird refuges and reserves in the US and Canada, though the fact that many African game reserves are only accessible by motor vehicle is, as he puts it, "a great leveller" **[6]**. Ironically, in the developing world, the more simple and basic the accommodation is, the better the access—especially for wheelchair users.

So things are improving for some minority groups at least. But in Britain and North America, one significant sector of society is either absent or very few and far between: Black and Asian people. Interestingly, this even applies to those whose families have been in their respective countries for several generations, and who therefore might describe themselves as 'African American', 'Black British' or 'British Asian'.

Several theories have been put forward to explain this, mostly focusing on two factors: a general lack of enthusiasm for 'outdoor leisure activities' amongst these ethnic groups, and a related feeling of 'standing out from the crowd' if they do attempt to engage in such activities and interests.

Given that birding is an intensely tribal pursuit, in which cliques and sub-groups tend to form, it is likely that the combination of an initial reluctance to take part (or simple lack of interest), combined with a heightened sense of being an 'outsider' if they do attempt to take up birding, is enough to keep participation amongst such groups so low. One of the very few black British birders, David Lindo, recalls being taunted by his black peers at school as 'Whitey' because of his interest in birds **[7]**.

The authors of the US Fish & Wildlife Service study suggest, probably correctly, that as birding becomes more prevalent amongst the general population, so the demographics will also change, becoming more inclusive:

> In the future, undoubtedly, we will see the demographic make-up of the American birder shift and become more diverse, just like the country's population is becoming more diverse. Women likely will assume a slightly larger share of the birding participant-base, Hispanic and Asian Americans are also likely to assume a higher profile, and more of the birding participant base is likely to be made up of persons under the age of 25. **[8]**

Whether this optimistic prediction will come true elsewhere is dependent on many complex social factors, beyond the scope of this essay. What can be said is that elsewhere in the developed world, such as Britain, there are factors increasing the participation of minority groups in birding; and other factors (such as difficulties of access, feelings of exclusion and changes in the way children are allowed to explore their surroundings) which may pull in the opposite direction.

In some parts of the developing world, day-to-day concerns such as the need to find food and shelter, avoid disease and simply survive may mean that the luxury of a 'leisure activity' such as birding is well-nigh impossible.

Birding, ornithology and conservation

As already discussed in Part 2, birding as a leisure activity not only derived from the science of ornithology, but has retained many links with it, not least through the participation of many amateur birders in large-scale scientific projects such as atlas surveys.

Likewise, birders are generally also keen conservationists: either active, by giving their time and effort to taking part in specific conservation projects; or more passive, as members of organisations such as the Audubon Society and the RSPB.

Of course, many professional scientists and conservationists are also active birders; indeed in many cases their interest in science and/or conservation began when, as a child or young adult, they became interested in watching birds.

Birders as 'Citizen Scientists'

Perhaps the most tangible contribution that many birders make to our ornithological understanding is through their participation in the simple, large-scale studies known collectively as 'Citizen Science'.

Because of their size, such projects typically use simple recording techniques to collect information about birds, their behaviour and where they live—providing basic ecological data which can then be used in a variety of ways, for example providing evidence of population changes of birds which can then inform government policy on environmental issues.

When well planned, Citizen Science studies can tackle quite complex ecological questions; for example, a study carried out by the BTO, in association with listeners to BBC Radio 4's Today Programme, revealed the complex patterns that influence the time at which birds begin foraging in winter. Foraging behaviour was found to differ according to habitat, with urban birds initiating foraging later in the morning because of the 'urban heat island' effect, which means that the climate in cities may be several degrees warmer than in the surrounding countryside **[9]**.

A number of ongoing, long-term monitoring schemes, for example the BTO's Garden BirdWatch, Cornell's Project FeederWatch and the Universities Federation for Animal Welfare's Garden Bird Health Initiative, rely on 'Citizen Scientists' to collect data on birds. Many of the participants in such studies would not consider themselves to be 'birders' but their regular weekly birdwatching generates information of sufficient quality to inform conservation policy and support ornithological research through a smaller network of paid professionals.

The power of such schemes can, for example, be seen from the way in which data from the BTO's Garden BirdWatch and the BTO/RSPB/Joint Nature Conservation Committee Breeding Bird Survey feed into UK government indicators charting the changing fortunes of bird populations **[10]**.

Similarly, it is only because of the backyard birders involved in Cornell's House Finch Disease Survey that researchers have been able to track the spread and impact of an emerging infectious disease, mycoplasmal conjunctivitis, in the North American House Finch (*Carpodacus mexicanus*) population **[11]**.

While science may seem to be becoming more and more esoteric and specialised, the day of the amateur making any useful contribution is far from over. Speaking at the 24th International Ornithological Conference (IOC), held in Hamburg in August 2006, Professor Jeremy Greenwood delivered a stirring account of the contribution of the amateur birder in Citizen Science projects **[12]**. Greenwood pointed out that, in Britain alone, birders spend 1·6 million hours a year contributing to bird surveys—work that has an estimated value of at least £20 million:

> Amateurs make a major contribution to ornithology and bird conservation science. They always have and there is no sign of their contribution diminishing. Though they may have no formal qualifications, they have considerable expertise, gained from many years of devotion to the subject.

For some birders this involvement in science goes much further, with individuals lacking formal qualifications going on to become recognised experts in their chosen area of study. UK birder Mark Constantine and his colleagues at the Sound Approach are a case in point, using their passionate interest in bird songs and calls to stimulate a reassessment of the taxonomic standing of recognised 'species' and a wider appreciation of bird calls and their function. They have become the leading experts in the field of avian sound recording, with acclaimed publications to their name and making a significant contribution to our wider scientific understanding **[13]**.

In fact, for many the division between time spent birding and that spent contributing to scientific study has become truly blurred. Records collected on birding trips and fed into BirdTrack (a partnership between BTO, RSPB and BirdWatch Ireland), not only feed through into county bird reports but are also being used to track changes in migration patterns **[14]**.

Additionally, and highlighting the conservation value of birding, the records collected through BirdTrack are also used to target valuable resources towards important bird sites. The Bird Conservation Targeting Project identifies these sites by mapping the distributions of birds of current conservation concern reported through BirdTrack and then uses this information to direct how millions of pounds in grant payments is distributed through agri-environment and woodland schemes within England.

Citizen Science projects are increasingly valued as weapons in the fight against environmental problems, not only because of the quality of their underlying scientific structure but also because they help to draw in a much wider section of society than seen in earlier surveys.

In Britain, the RSPB's Big Garden Birdwatch **[15]** (which annually attracts about half a million participants, including many families and, importantly, school children) reaches many people who would not consider themselves to be 'birders', thanks largely to widespread media coverage, especially on national radio and in the newspapers. The survey not only provides a snap-shot of birds in gardens but it also engages participants with science and the underlying conservation messages that the organisation puts across.

A similar scheme operating in North America, the Great Backyard Bird Count, annually records more than seven million individual birds of over 620 different species.

Whatever the level of involvement, from the backyard birder to someone who monitors a local patch or participates in nest recording or bird ringing, the role of the Citizen Scientist cannot be overestimated. As Professor Greenwood pointed out in his presentation to the IOC, sceptics have been predicting that the day of the amateur will soon be over for about 200 years! The role of the amateur has never been so strong as it is today and this bodes extremely well for the future.

Developments in science and their effects on birding

In 1990, two books published by Yale University Press caused a revolution in the worlds of ornithology and birding. Their titles—*Phylogeny and Classification of Birds* **[16]** and *Distribution and Taxonomy of Birds of the World* **[17]**—and their combined weight of several kilos, guaranteed that they would never reach the top of the best-seller lists. But their content, once it had been analysed and understood by the wider birding community, was the ornithological equivalent of a ticking time-bomb.

The authors were a trio of highly respected US biologists, Burt L. Monroe Jr., Charles G. Sibley and Jon E. Ahlquist. Their long study of bird taxonomy and classification, using new techniques to analyse DNA of individual species and related taxa, had reached some extraordinary conclusions. Not only did the authors propose an entirely new 'family tree' of the world's birds, with radical changes in relationships between families and groups; they also revealed that their studies had effectively created hundreds of 'new' species.

Distribution and Taxonomy of Birds of the World, written by Sibley and Monroe, produced a revised list of the world's living bird species—9672 in all—arranged according to the new classification, with explanatory notes on each, concentrating especially on taxonomy at the species level.

Phylogeny and Classification of Birds, by Sibley and Ahlquist, explained the complex scientific reasoning behind these changes. Its subtitle, 'A Study in Molecular Evolution', was a clue to the revolutionary nature of the approach. Until then, taxonomists had used a tried and trusted range of methods to classify the world's birds, including structural (also known as morphological) characters, such as shape, colour and anatomy; and behavioural characters such as courtship display and song.

The problem with these traditional methods was that they often relied on subjective comparisons between species, genera and families; comparisons that could sometimes produce wildly inaccurate results. This is due to two related but opposite factors: adaptive radiation and adaptive convergence.

Darwin's finches (Emberizidae), a group of 14 species found mainly in the Galapagos, are an excellent example of adaptive radiation: whereby species exhibiting very different appearance, traits and habits have been found to have evolved from a common ancestor. Adaptive convergence is shown by many families of Australian birds, such as the fairy-wrens (Maluridae), which despite their superficial resemblance to Eurasian bird families, are not closely related to them. Both adaptive radiation and

convergence can make it extremely difficult to work out the actual evolutionary lineage and relationship of a particular species or individual bird.

The new, molecular-based, approach promised—at least according to its most zealous proponents—to clear away all the doubt and confusion. Based on a process known as DNA–DNA hybridisation, it used biochemical techniques to compare the DNA of one species with another, and depending on the results, to work out the closeness of the relationship between them.

For the ordinary birder, the conclusions were exciting and baffling in equal measure. To give just one example amongst many, the existing order Ciconiiformes traditionally comprises several families of long-legged wading birds, including storks (Ciconiidae), ibises and spoonbills (Threskiornithidae), and herons, bitterns and egrets (Ardeidae)—about 120 species in all.

The new Ciconiiformes expanded this massively, also including such diverse groups as waders/shorebirds, gulls, terns and auks (Charadriiformes); cormorants, gannets and boobies (Pelecaniformes); day-flying birds of prey (Falconiformes); penguins (Sphenisciformes); grebes (Podicipediformes); divers/loons (Gaviiformes) and pelagic seabirds such as petrels, shearwaters and albatrosses (Procellariiformes)—a grand total of well over 1000 species from no fewer than eight existing orders. Incidentally, though many of the new findings have since been accepted by the scientific community, this particular hypothesis appears to have been comprehensively discredited.

At the species level, the new technique revealed even greater surprises, with many species being 'split' into two or even more new forms, each a species in its own right. So Bonelli's Warbler, from southern Europe and western Asia, was split into two new species, Eastern (*Phylloscopus orientalis*) and Western Bonelli's Warblers (*Phylloscopus bonelli*). To add to the confusion, DNA studies apparently revealed that another species, Wood Warbler (*Phylloscopus sibilatrix*), appears to be more closely related to both the new species than either was to the other.

The major problem with the new approach, from a birder's point of view, was that by overturning the established order it went to the heart of one of the main ways in which the ordinary birder deals with the birds they see—by listing them as different species.

So if, as was apparently the case, new scientific techniques were going to completely change not only the relationship between families and species, but also effectively 'create' a whole new range of species, the potential for confusion was obvious. Would bird books have to be updated every year or two to include new discoveries? Would some species, such as the Red Crossbill (*Loxia curvirostra*), be split into so many new species that the ordinary birder would be unable to tell them apart in the field? Might there in fact be as many as 20,000 different species out there, as opposed to fewer than 10,000, as previously assumed?

In fact, after the initial furore, the application of the new science took longer than expected, and had less of an apocalyptic effect than had been predicted. So, for example, the fifth edition of James F. Clements' *Birds of the World: a Checklist* **[18]** (published in 2000) included 9800 species. Moreover, these were arranged in the traditional order, beginning with the ratites (Ostrich and its relatives), and progressing through penguins, divers, grebes and procellariiform tubenoses.

In the Foreword to the fifth edition, William T. Everett defends Clements' conservatism by pointing out that any attempt to keep up with new findings would be rendered "at least partially obsolete" almost immediately after publication. And while acknowledging the enormous strides made by Monroe and his colleagues, Everett also warns that this might not be beneficial to everyone:

> This is how science progresses but it is not particularly good news, for example, to birders who want to keep track of their observations or curators who have to keep thousands of avian specimens properly cataloged, sorted and organized.

Other authors and publishers have been quicker to adopt at least some of the new findings. The most recent checklist, *Birds of the World: Recommended English Names* **[19]**, by Frank Gill and Minturn Wright (published in 2006) includes just over 10,000 species; and places tinamous at the front, followed by ratites, gamebirds and wildfowl (ducks, geese and swans), before returning to the more conventional order.

Almost two decades on, with the benefit of hindsight, we can look back on the new approach as a major evolutionary step rather than a giant revolutionary leap. As Christopher Leahy wrote in 2004:

> The Sibley-Ahlquist phylogeny should not be seen as the new Truth vanquishing a discredited earlier version. It is rather a hypothesis—a bold one—supported by some proofs. Both its experimental design and analysis of the data have been criticised by

> colleagues…There is no question, however, that increasingly sophisticated methods of DNA analysis have opened a new path of biological systematics that will provide immense opportunities for new research… for decades to come. **[20]**

Back in the field, one current benefit of the new approach is that it has encouraged birders to take a closer look at 'odd' birds—either a well-marked subspecies or perhaps simply something 'a bit different from the rest'—rather than dismissing them as mere curiosities. However, groups such as the *Motacilla flava* wagtail complex, or the larger gulls of the genus *Larus*, appear to blur the distinction between species and even subspecies, by presenting a bewildering range of minor differences between individuals and populations.

Dutch birder and ornithologist Arnoud van den Berg, whose field experience of the world's birds is more extensive than almost anyone alive, takes a view that mixes inquiry and flexibility in equal measure. He regards every taxon (a term which includes any distinctive group of birds whether or not they merit full specific status, including subspecies) as worthy of interest. In these uncertain times, this seems to be an eminently sensible approach **[21]**.

Birding and the media

For many years, birding was rarely covered in the mass media; and when it did appear, it was usually represented as something rather amusing, peculiar or sad: the widespread use of puns based on the word 'twitcher' indicating a rather patronising journalistic attitude towards the pastime.

Indeed, the 2001 tabloid story that US pop star Britney Spears might be a birdwatcher (based on the acquisition of pictures of birds for the walls of her Los Angeles home) was based on the fact that the juxtaposition between the coolest teen pop idol and birding was, quite simply, ridiculous.

Nevertheless, birding (and its sister science, ornithology) not only receives considerable coverage nowadays, but the tone of that coverage is subtly changing. When the *Guardian* commissioned a major feature on the BBC television event *Springwatch*, in June 2005, it chose the respected writer and novelist Blake Morrison to cover the story **[22]**. He, in turn, avoided the usual tongue-in-cheek journalistic style, and instead wrote a thoughtful analysis of why what he called a "real-life avian soap-opera" had become such a hit with the public.

Morrison observed that the series allowed viewers to satisfy (albeit vicariously) "a dream of living in close harmony with nature", and concluded that its success was another indication that the British public was "quietly falling in love with nature again".

BBC Radio 4, which tends to attract an older and more conservative audience than does television, covers birding stories less flippantly than its television and newspaper counterparts. The early morning *Today* programme, in particular, has a long tradition of featuring such events as the RSPB's Big Garden Birdwatch—something that has undoubtedly contributed to the massive increase in the numbers of people taking part in this annual survey.

More recently, even the advertisers have got in on the act. Fans of Bill Oddie's wildlife programmes may have been surprised to see footage of thousands of Common Starlings (*Sturnus vulgaris*) indulging in their pre-roost aerial displays appearing in an advert for a well-known brand of lager.

At one of the best-known Common Starling roosts, on the Somerset Levels, the arrival of dozens of visitors hoping to see the evening flight prompted a lively debate on the website of the Somerset Ornithological Society **[23]** as to the drawbacks and benefits of so many novice birders (and indeed non-birding members of the general public) wanting to see the spectacle for themselves.

The popularity of the Common Starling roost has revealed how quickly an avian spectacle known only to a select few can, with the aid of the media, rapidly become a public event. If more and more people who do not consider themselves to be birders nevertheless begin to visit sites to watch birds, the distinction between 'birders' and 'non-birders' will blur even more. Eventually, perhaps, birding may simply become something the majority of people do—a bit like gardening or cookery—rather than a relatively specialised pastime.

New technology

One of the main themes of my book on the social history of birdwatching, *A Bird in the Bush*, was how the development of new means of communication (especially,

though not exclusively, those that have allowed a more rapid spread of rare bird sightings) helped to promote changes in the way we watched birds.

The progression went something like: postcards (1950s), domestic telephones (1960s and 1970s), mobile phones and pagers (1980s and 1990s) and the Internet (early 21st century). Without such rapid (and largely unforeseen) developments in communications technology, it is hard to imagine that birding would have developed in quite the way it did.

Today, the keen birder has a plethora of communications aids, enabling them to get up-to-the-minute news of sightings, virtually wherever they are—mobile signals permitting. The widespread use of personal pagers, in particular, has had major changes on the way many people watch birds.

In the old days (actually not so old—perhaps two or three decades ago), people had little or no choice but to go out and find their own birds. Nowadays, it is sometimes said that it is better to sit in one, centrally located, place; wait for the pager to alert you to the news of a bird's arrival; then dash off to see it.

One British birder has scathingly dismissed those who indulged in this practice as "the prawn sandwich brigade" **[24]**—itself a reference to a comment made by Manchester United footballer Roy Keane about a new breed of football fans, who want all the benefits of supporting a major team without undergoing any of the discomforts. This fits in with a long tradition in British birding subculture—that you have to suffer the bad times to appreciate the good.

Once our new birder has located the site of a rare bird (using first a pager and then a satellite navigation system), they now have a range of gadgets with which to confirm its identity and create a record of the sighting. Field guides and notebooks are, most definitely, out; electronic guides held on a palmtop device (including pictures *and* sounds), 'pens' containing a selection of bird calls and songs that can be retrieved instantly in the field, video cameras, and 'digiscoping' (attaching a digital camera to a telescope in order to get a long lens shot of the bird) are in.

Digiscoping (a technique originally developed in Malaysia by Laurence Poh **[25]**) means that once the picture (or indeed video clip) is obtained, a birder can use mobile technology to send it instantaneously to other birders—especially important if the identity of the bird is in question.

One unforeseen result of this is that the type of thorough, complete notes required by national and state or county records committees, are hardly ever taken nowadays—after all, goes the reasoning, what is the point when you can take a picture of the actual bird? Indeed, in 2006 no fewer than three potential 'firsts for Britain'—an Olive-tree Warbler (*Hippolais olivetorum*), Black-eared Kite (*Milvus migrans lineatus*) and Long-billed Murrelet (*Brachyramphus perdix*)—were initially misidentified in the field, their true identity only coming to light after images of the birds were posted on the web.

Sceptics believe that a decline in note-taking, and a reliance on photographic evidence as opposed to close observation of the bird, will lead to a falling-off in field identification skills—and they may well be right. After all, some of the developing world's greatest field birders, such as Hadoram Shirihai in Israel, learnt their trade without any optical aids at all—not even binoculars.

Another use of new technology is to help human observers. Much in the same way as closed-circuit television (CCTV) cameras reduce the need for human security, so the installation of a huge robotic camera in the area where the Ivory-billed Woodpecker (*Campephilus principalis*) was supposedly sighted (in the southern US state of Arkansas) aims to capture sightings of this elusive (and possibly actually extinct) bird. In an article headlined 'Spy cameras on the bayou could spell end of twitchers', a spokesman from Cornell University was quoted as saying:

> Humans are expensive, and they're not always alert, and their presence disturbs the environment, even when they're camouflaged and sitting quietly. **[26]**

New technology is not solely used with regard to rare birds. The Internet allows new kinds of communication—either between birders in different parts of the country or around the world, or between birders and ornithological organisations—to work in ways we could not have envisaged even a decade ago. The BTO's BirdTrack programme allows participants to log on and check sightings of migratory birds, and indeed post sightings of their own. BirdTrack is a quick, efficient and highly effective way of mobilising thousands of ordinary birders in order to contribute to our scientific knowledge of birds **[27]**.

A global version of this, proposed at a meeting of conservationists in Edinburgh in autumn 2003, involves a worldwide 'air traffic control' network to monitor the movements and numbers of migrating birds across the globe **[28]**.

But whatever we think about it, and whatever the consequences for the future of birding, new technology is here to stay—and the next decade or so will undoubtedly see even greater technological advances to help birders.

The economic importance of birding

It has long been understood that birds themselves—or at least our exploitation of them for food, fuel and other products—contribute major benefits to regional, local and (at least in the case of the domestic chicken) global economies. There are far too many examples to list in full, but even a random selection gives some idea of how human civilisation might have taken a very different course had we not learned to exploit wild, and later domesticated, birds:

- The domestic chicken, whose ancestor is the Red Junglefowl (*Gallus gallus*) of southern Asia, is easily the commonest bird in the world. With estimates of between eight and 35 billion individuals, its population comfortably outranks the number of human beings on the planet (approximately 6·5 billion).
- The islanders of St Kilda, a remote island group off north-west Scotland, were known as 'the bird people' because they lived almost entirely on seabirds, which they used for food (meat and eggs), fuel (burning the oil from the fatty young) and even clothing (whole Northern Gannets (*Sula bassana*) were used as primitive slippers!).
- The droppings of the Guanay Cormorant (*Phalacrocorax bougainvillii*) of South America, which are rich in nitrates, have been harvested for centuries for use as fertiliser, bringing profit to the people of various South American countries where it occurs. During the late 19th century Chile, Bolivia and Peru even went to war over the guano supplies.
- The use of bird feathers and skins in women's fashion reached a peak during the late 19th and early 20th centuries. During a fifty-year period between 1870 and 1920, 20,000 tons of plumage, from millions of individual birds, were imported into the UK.
- Since 1934, the US government has raised revenue from hunters through the sale of 'duck stamps'—effectively permits allowing the right to shoot waterfowl. In the year 2000, over US$25 million of revenue was generated by the programme.
- Birds are frequently used for advertising and marketing purposes, as manufacturers, retailers and other businesses seek to increase their sales or improve their public image, by association with some of our favourite creatures. Perhaps the best-known of a myriad of examples are the famous 'Guinness toucan', created in 1935 to advertise the well-known brand of Irish beer; Swan Vestas matches; and the publishing imprints Penguin Group and Puffin Books.

There are countless other examples of our exploitation of birds for direct or indirect economic benefits. But what about the economic benefits of *watching* birds? Until recently, very little attention had been paid to the actual and potential spending by birders, but nowadays both the US Fish & Wildlife Service and the RSPB are beginning to produce detailed reports on this important aspect of birding.

Economic value of birding in the US

In the US, the figures are simply staggering. In 2001, according to the US Fish & Wildlife survey **[29]**, wildlife-watchers (of which birders represent the vast majority) spent a total of US$31·7 billion in pursuit of their hobby. To put this figure into perspective, it almost exactly matches the annual Gross Domestic Product (GDP) of Costa Rica, a popular travel destination for US birders.

Of this sum, the largest costs were travel-related, including the purchase or hire of vehicles, the services of expert guides, and food and lodging. Participants spent over US$1·9 billion on optical equipment, including binoculars, telescopes and cameras; over US$0·6 billion on nest boxes and bird feeders; and a staggering US$2·2 billion on bird food—equivalent to two Big Macs for every man, woman and child in the US.

Overall, the impact of wildlife-watching on US economic output is even greater: its total economic value has been estimated as US$85 billion a year, producing US$13 billion in state and federal tax revenues and creating over 860,000 jobs—a substantial contribution to the country's economy.

On a local level, the economic impact of birders is even greater, as the report's author points out:

> Towns such as Cape May, New Jersey, and Platte River, Nebraska, attract thousands of birding visitors each year generating millions of dollars—money that would likely otherwise be spent elsewhere.

The survey as a whole illustrates the immense scale of birding-related expenditure, something welcomed by Julian Hughes of the RSPB **[30]**. However, he has also pointed out that the methodological approach of the survey does raise some important questions, and also make like-for-like comparisons between the US and the UK more difficult.

The main problem is that the survey takes a very liberal view of the kinds of expenditure related to birding activities: for example it includes the sales value of cars, boats and other personal transport (totalling more than US$11 billion), despite the fact that not even the keenest birder owns a car purely in order to go birding. Other questionable figures include more than US$4 billion for 'land leasing and ownership', over US$500 million for camping equipment, and more than US$2·6 billion on food.

As a result, the figures for total birding-related expenditure have been, Hughes believes, greatly exaggerated, and the true figure is likely to be much lower—perhaps in the region of US$5–10 billion—nevertheless, still a staggering amount.

Economic value of birding in the UK

With a much lower population (60 million compared to over 300 million) and smaller economy (US$2·2 trillion compared to US$12·49 trillion—2005 figures **[31]**), the United Kingdom's statistics may appear rather insignificant compared to those of the United States.

Another reason the figures are lower is that UK economists do not measure the *total* spending made by birders on their hobby, but instead measure the *extra* spending people make because they watch birds.

On a regional and local level, there is no doubt that birders do make a significant contribution to the economy. In 2006, the RSPB produced a report, *Watched Like Never Before* **[32]**, on the local economic benefits of what it called 'spectacular bird species'—mainly raptors such as the Osprey (*Pandion haliaetus*), White-tailed Sea-Eagle (*Haliateeus albicilla)*, and Red Kite (*Milvus milvus)*, but including a variety of other species and groups.

As the report noted, the phenomenon of mass viewing of birds is not confined to traditional birding sites:

> Spectacular birds attract attention from the popular media, which in turn stimulates the public to visit sites and watch them in new ways… The resulting social and economic benefits can occur anywhere, from office-workers enjoying city-centre Peregrines (*Falco peregrinus*) in their lunch break, to tourists visiting seabird colonies on remote islands.

The report does not attempt to provide a total figure for the economic benefits of birding in Britain, but instead concentrates on specific sites, most of which are promoted by the RSPB in its *A date with nature* scheme **[33]**, which provides expert guides to show these spectacular birds to the general public.

Even so, the sums generated are economically significant, especially in remote parts of the UK such as the Scottish Highlands and Islands, which rely heavily on tourism for revenue.

For example, an estimated 290,000 people now visit sites with nesting Ospreys each year—mainly Loch Garten in Scotland, but also other locations in Scotland, England and Wales. In doing so, they bring an estimated additional expenditure of £3·5 million per year, making the Osprey, in the report's words, "probably the UK's top bird-tourism species".

Another spectacular bird-of-prey attracting visitors is the White-tailed Sea-Eagle (popularly known as the Sea Eagle). Following a successful reintroduction programme (the species became extinct as a British breeding bird during the First World War), a number of pairs of Sea Eagles now breed on the Isle of Mull. Visitors to the island spend about £38 million every year, of which approximately £1·4–1·6 million is generated by the presence of the eagles.

The RSPB has estimated the number of jobs created by this extra revenue, using a figure of one full-time post created by every £38,650 of expenditure. As a result, about 90 jobs have been created by the presence of Ospreys, and between 36 and 41 jobs from the Sea Eagles—a significant figure on an island with a population of fewer than 2000 people.

Together, the RSPB's 200 nature reserves in the UK attract over 1·5 million visitors each year. In 2006, these visitors spent almost £19 million on products and services in the local communities around these reserves, supporting almost 500 jobs. In addition, the management of these reserves has created a further 1000 or so jobs. While insignificant at a national level, many of these jobs are in rural areas where traditional employment opportunities have diminished.

But as in North America, by far the largest sums spent on birds and birding in the UK are those related to feeding and providing nesting places for garden birds. Bird gardening has a long history, going back to the 6th century, when St Serf of Fife first tamed a European Robin (*Erithacus rubecula*) by giving it food. Regular feeding of birds began in the late 19th century, while the first decade of the 20th century saw the arrival in Britain of the first nestboxes, imported from Westphalia in Germany and sold for sixpence each—about £1 in today's money.

However, until two or three decades ago, providing food and homes for garden birds was little more than a cottage industry, with supplies mainly provided by pet shops and other local retailers. Some retailers, such as Haith's (which started in 1937 in a pet shop in Cleethorpes, Lincolnshire, UK) had been retailing specialised food and feeders since before the Second World War. But it was not until the 1980s that the market began to become really competitive. The following decade saw an unprecedented expansion in the bird food industry, with several major companies setting up mail-order retail outlets.

The BTO has estimated the value of the industry today at approximately £200 million per annum **[34]**. The figures for the consumption of individual products are equally staggering: 16,000 tonnes of peanuts, 30,000 tonnes of sunflower seeds and 2000 tonnes of fat products. As a result, the number of species coming to feeders in the UK has grown to more than 100, and several species formerly rare or absent from gardens, such as European Goldfinch (*Carduelis carduelis*) and Eurasian Siskin (*Carduelis spinus*), are now regular visitors.

Until a reliable, detailed study is carried out, only a rough estimation of birders' total contribution to the UK economy as a whole can be made. But using a simple extrapolation from the US figures, the UK's 2·85 million birders probably spend £500 million—perhaps as much as £1 billion—on their hobby each year.

Economic value of birding in the developing world

In the developing world, birders also bring significant economic benefits, simply by visiting different countries, regions and sites to watch birds. Unfortunately no reliable studies have been made on actual revenues, so we can only guess how much this is actually worth in economic terms.

Given that hundreds of thousands—probably millions—of birders travel abroad every year to watch birds, the sums involved are likely to be colossal. Of course much of the profits generated by foreign bird tours go to international airlines, major hotel chains, and the bird tour companies themselves, rather than remaining within the local economies where the birding actually takes place.

However, the recent trend towards environmentally and socially responsible ecotourism does mean that many bird tour companies do try to spend as much as they can on local goods and services, while others pay a small percentage of their profits towards local conservation projects.

As foreign travel has become the norm rather than the exception, birders have broadened their horizons by visiting more long-haul destinations. Of these, perhaps the best-known are Costa Rica and Trinidad and Tobago, both of which attract large numbers of visitors from both North America and the UK. While Tobago has always been a popular holiday destination, Trinidad has not, so the annual influx of birders to locations such as the Asa Wright Nature Centre and the Pax Guest House makes an important contribution to the local economy.

In the Old World, long-haul holiday destinations such as The Gambia and Thailand have also proved popular, especially with British visitors. And during the 1980s and 1990s, the British tour company Sunbird pioneered a series of relatively low-cost (at least in bird tour terms) package holidays to places such as Eilat in Israel, the Indian resort of Goa, and even the Chinese seaside resort of Beidaihe.

In many of these destinations, such as Trinidad and Tobago and The Gambia, local birders can now make a good living from becoming tour guides, often accompanying a leader from the US or UK, and providing up-to-date local knowledge and expertise. Ironically, their extraordinary ability to identify the birds they see derives from the fact that most spent their formative birding years either using poor-quality binoculars, or in some cases without any optical aids at all.

An example of how birding contributes to a local economy, albeit on a small scale, is the 'Jardin de los Picaflores' in the small town of Misiones, near the Iguazu Falls in northern Argentina. This private garden attracts up to 16 different species of hummingbird (Trochilidae), coming to feed on nectar provided by the householders. By selling a colour brochure about the hummingbirds, and asking for a small finan-

cial contribution, at least one family enjoys a financial benefit from a steady stream of foreign birders. The birds are likely to benefit as well: if local people can make money from the bird-friendly exploitation of local species, they are more likely to ensure that birds and their habitats are protected against damage from other economic interests.

Elsewhere, similar projects are also helping both people and birds. In South Africa, the Zululand Birding Route **[35]** was established in 1997, and along with the Greater Limpopo Birding Route, is worth an estimated US$6·8 million per year to the region. On the tenth anniversary of the establishment of the route, in 2007, of BirdLife South Africa's Duncan Pritchard commented:

> To see the Zululand Birding Route reach 10 years is testament to how simple and effective the avitourism [birding ecotourism] concept has been in this case... There have been winners all round: local economies, jobs, education and, of course, the birds. **[36]**

South Africa has, of course, a long birding tradition. But even in places where birding is a relatively recent pastime, the link between conserving birds and tourism is now being made. In the central Asian republic of Azerbaijan, for example, government officials have included the country's 52 Important Bird Areas (IBAs) in their national tourism plan, and provided an infrastructure for birding tours, thus ensuring their continued protection **[37]**.

The dignified and low-key nature of these projects is in stark contrast to the frenzy of commercial exploitation that followed an apparent sighting of the potentially extinct Ivory-billed Woodpecker in the forested swamps of Arkansas, in early 2004. The reaction of one excited ornithologist set the tone: "It's kind of like finding Elvis!" **[38]**.

For the people of Brinkley, the nearest small town to where the woodpecker had been sighted, the arrival of thousands of birders, accompanied in its train by the news media bandwagon, was like a modern-day goldrush. Local businesses sought to exploit the woodpecker in any way they could: one motel changed its name to 'The Ivory-billed Inn', while 'ivory-billed salad' and 'ivory-billed burger' were on the menu at Gene's Restaurant and Barbeque. A local barbershop even offered an 'ivory-billed' haircut, a variation of the Mohawk style complete with a red tint.

The only problem was that despite reports to the contrary, the Ivory-billed Woodpecker may actually be extinct. Expert ornithologists have begun to question the authenticity of the initial observation, and despite dozens of alleged sightings elsewhere in the southern states of the US, the woodpecker may indeed live up to its reputation as the Elvis Presley of the bird world.

Part 4: Birding Future

> *With his television outfit set up in a Devon heronry or at a lek of a blackcock in Northumberland the bird-watcher of the fairly near future may check, without leaving his house, or perhaps without leaving London, detailed observations painfully secured by isolated pioneers cramped, wet through, at dawn under flimsy canvas hides. It may be shocking that the acuter discomforts of bird-watching should be abolished for those willing to command increasingly intricate apparatus, but that undoubtedly is the way we are going.* **[1]**
>
> Max Nicholson, 1931

Despite the uncanny accuracy of Max Nicholson's 1931 forecast, which prefigured the arrival of webcams by about 70 years, making predictions about the future development of global birding is not an easy task. Indeed anyone who does so is likely to be proved wrong very rapidly, such is the complexity of the various factors involved.

So rather than making firm forecasts about how birding is likely to grow and develop during the coming decades, I shall instead endeavour to identify key factors which, in my opinion, are most likely to affect that development.

Broadly, these break down into three main categories:

- **The current and future status of bird species**.
- **How technological changes are likely to impact on birding**.
- **Environmental issues and birding**.

Finally, I shall draw on the thoughts of previous and current writers on birding, in order to answer an apparently simple question once posed by the legendary American bird artist Roger Tory Peterson **[2]**:

- **What are birds for?**

The current and future status of bird species

In 2000, BirdLife International and Lynx Edicions published what may prove to be the most important book on birds ever to appear. *Threatened Birds of the World* **[3]** was a catalogue of no fewer than 1111 of the world's bird species, representing about one in eight of all the species currently in existence.

Each of these species had become enough of a cause for concern to be placed on The IUCN Red List of Threatened Species, which included all birds potentially at risk of extinction, in categories ranging from 'Extinct' or 'Extinct in the Wild', through 'Critically Endangered' and 'Endangered', to 'Vulnerable'.

Since then, the number of species on the Red List has risen to 1227, of which 192 are classified as Critically Endangered, 15 of which are possibly already extinct (2009 figures) **[4]**. With more than 800 further species categorised as 'Near Threatened', this means that well over 2000 species—more than one in five of all the bird species in the world—are considered urgent priorities for conservation action. Of these, it is predicted that more than 200 species will become extinct by the year 2100—more if the factors affecting their declines get worse. This compares with an estimated total of about 80 to 100 species having become extinct since the year 1600 **[5]**—an increase of a factor of between ten and twelve in the rate of extinction.

Other studies are even more pessimistic. A 2004 report from the Stanford Center for Conservation and Biology in California **[6]** suggested that in a worst-case scenario one in four of all bird species—2500 in all—could become extinct by the end of the 21st century. Even the best-case scenario predicted that 700 species would be lost, while the intermediate figure was 1200 species. As Dr Russell Mittermeier, President of Conservation International, has said:

> All the indications are that we are standing at the opening phase of a mass extinction event. **[7]**

The reasons for the unprecedented decline and imminent extinction of so many bird species are depressingly familiar: human over-population, leading to widespread destruction of habitat (which once gone may be either very difficult or impossible to recreate); hunting for food or sport; and pollution (especially of wetlands). Now we face the new and terrifying spectre of global climate change, which threatens to alter our weather patterns, habitats and ecosystems more catastrophically and rapidly than ever before **[8]**. As Dr Stuart Butchart of BirdLife International noted in the 2008 report:

> Species are being hit by the double whammy of habitat loss and climate change. **[9]**

The authors of *Threatened Birds of the World* put the situation into stark clarity: we are both the problem and, potentially, the solution. Birders—especially those travelling to poorly-known regions of the world—have long been a vital tool in collecting information about the birds of a particular area, and at times instrumental in saving them and their habitat from destruction. In the future, their role promises to be even more critical:

> The challenge… is to promote behaviour changes amongst the world's people. These changes should effectively conserve threatened birds, and the habitats, sites and ecosystems in which we all live. **[10]**

But despite the optimism of this statement, pessimists might take a very different view: in the future, will there be any birds left for people to see? Of course some species will continue to prosper, especially those which have adapted to live alongside man and exploit our wasteful misuse of resources, but these are not usually the birds most sought-after by birders travelling abroad.

And if birders are no longer willing to pay large sums of money to travel to watch birds, or decide not to travel so as to reduce their 'carbon footprint', what effects might this have on the local economies of such places that have grown to depend on an annual influx of visiting birders? A vicious circle could ensue, in which the reduction in numbers of people travelling to watch birds, and the consequent fall in income

related to ecotourism activities, leads to the inability to protect the birds and their habitats that people are no longer coming to see.

A different, but equally valid, point of view is that a reduction in global birding tourism could ultimately be for the benefit of the birds, as Dr Nigel Collar of BirdLife International suggested in his Foreword to Volume 5 of the *Handbook of the Birds of the World*, in 1999:

> Birdwatchers and biologists get to ever more remote places by virtue of new airports, new logging roads, new tourist facilities. They arrive as tiny components of the great machinery of economic development which, in a few short years, mutilates natural landscapes and human cultures beyond recognition and brings Coca-Cola, television, chainsaws, DDT and debt to every cultivable corner of the planet. By the year 2010 not only will we know more about birds than ever before… we will also have most of them *completely surrounded*. **[11]**

How technological changes are likely to impact on birding

Technology changes so rapidly, and so unpredictably, that any specific examples I might give may seem hopelessly wide of the mark in just a few years time. Nevertheless, we can be fairly sure that the breakneck pace at which computing power is able to increase, combined with the increased economic purchasing power of birders, means that the pace of change is likely to accelerate at an even faster rate.

Birders, like any other community of people, are quick to take advantage of new ways of communicating. So just as pagers and mobiles dominated the late 20th century, and e-mail and websites have so far dominated the early 21st, we can expect that recent changes in the Internet will soon be taken up by at least some birders.

Social networking services such as MySpace (more than 100 million users) and Facebook (more than 200 million users) allow rapid and informal communication; while similar use of shared spaces by 'closed' communities (such as schools and universities) are now being mimicked by online birding communities in the UK, US and Australia, and elsewhere **[12]**.

Given the global nature of birding nowadays, the Internet is the perfect way to communicate sightings, opinions and advice between individuals anywhere in the world, and can only help develop the cohesive nature of birding in the 21st century. The sense of isolation felt by many new or young birders as recently as two or three decades ago is surely gone forever. In tomorrow's world, the novice birder will need to learn to cope with too *much* information and too *many* ways to communicate with other birders, rather than too little and too few.

Another factor which might put a brake on progress—certainly for individuals in the developing world—is expense. Gadgets such as field guides on a PDA (Personal Digital Assistant—a small, hand-held computing device), or a microphone attached to binoculars which can digitally record the sound of a singing bird, may be assets, but they also cost money. Just as the wide difference in cost between cheap and expensive binoculars can create 'second-class' birders disadvantaged by their cheap optics, so the ever-increasing need to update hi-tech gadgets may do the same.

But however much technology may change, the fundamental needs of birders remain remarkably similar to those of a century ago: discovering good places for birds, getting there, and identifying the birds once you find them. And it is this latter, fundamental building-block of identification—for after all, you cannot really learn about a bird until you know to what species it belongs—which may see the most radical changes.

We already have the ability to take a sample of DNA from a captured bird, and analyse this to assign that particular individual to a known species. This has been compared to a kind of 'barcode'; so the logical next step is to wonder if a device could be invented that could 'read' this code in the field—making field identification skills redundant virtually overnight.

This scenario was envisaged by Irish birder Anthony McGeehan in *Birdwatch* magazine a few years ago **[13]**. It was only after reaching the conclusion of McGeehan's article, that most readers realised that it was, of course, an April Fool's Day spoof. Maybe it soon won't seem so far-fetched after all. Professor Paul Hebert of the University of Guelph in Canada has now set out to create unique barcodes—similar to those used to identify products in our supermarkets—for each individual species of plant and animal in the world. He claims that the system is accurate in 98% of cases, and that within five years every species on the planet (or at least all those known to us) will have its own barcode **[14]**.

Environmental issues and birding

The next uncomfortable question for today's birders is this: even if we want to travel to see birds around the world, will we be able to?

Three major factors are making it more and more difficult to watch birds in far-flung corners of the world. The first is political instability: nowadays, few birders visit Middle Eastern trouble spots such as Jordan, Syria and even Israel; nor are there many regular tours to Colombia. People are naturally put off by the perceived (and sometimes very real) dangers of travelling in such regions; and where they have a choice, will go elsewhere **[15]**.

Second, the recent 'credit crunch', in which the world's major economies (in both the developed and developing world) are entering what may be a prolonged period of economic recession, will no doubt have impacts on the numbers of people able to afford expensive birding holidays.

But the biggest change in our travelling habits is a consequence of our wastefulness and profligate use of the world's resources in the past. Now that global climate change is fast rising up the political agenda (even, finally, in the US, where successive governments have ignored the problem in the vain hope that it would go away), there are demands for 'something to be done'.

This is likely to take the shape of measures designed to reduce the carbon footprint of each individual: such as increased taxes on air travel and aircraft fuel; and ultimately individually based 'carbon allowances'—effectively a form of rationing. Given that currently each American emits 20 tonnes of carbon per year, and each Briton ten tonnes (compared to just three tonnes per person in China and one tonne per person in India), it is likely that long-distance air travel will eventually undergo a rapid decline in accessibility. This would effectively put paid to non-essential inter-continental travel, and the current era of global bird tours would enter a period of rapid and possibly terminal decline.

If the more extreme predictions about the effects of climate change on our ecosystems come true, then not only will we be unable to travel to see birds, but even if we did so, there would be very little to see. A depressing thought, but potentially a realistic one.

Looking on the brighter side, birding in one's local area—the regular watching of a 'local patch', or on a wider scale, county or state—is likely to become much more important. As Mark Obmascik notes in his account of obsessive birding in North America, *The Big Year* **[16]**, the era of trans-continental twitching was effectively brought to an end by the terrible events of 9/11. Obmascik points out that Sandy Komito, the record-holder for the most species seen in a single calendar year (achieved in 1998), was travelling "in a different, friendlier world":

> It would not be easy to log 270,000 last-minute miles through the increased security of today's borders and airports.

As birders turn towards the birds of their local area, some benefits may occur. The reduction in geographical horizons is likely to lead to a decline in the recent obsession with seeing rare birds and logging long lists of species, and a greater focus on the interests of an earlier age: such as the intricate details of bird behaviour, which so fascinated the pioneering birders of the early 20th century.

The literature of birding, too, has taken a very different turn. Books such as Scott Weidensaul's *Return to Wild America* **[17]**, Mark Cocker's *Crow Country* **[18]** and my own *A Sky Full of Starlings* **[19]** have resurrected and updated a fine tradition of personal writing about natural history—and what birds and the landscapes they live in mean to us.

Epilogue: What are birds for?

This brings me to my final question: what are birds for? This was originally posed in 1966, as the title of an essay written by Roger Tory Peterson in a book published by the US Department of the Interior entitled *Birds in Our Lives* **[1]**.

The question was put to Peterson at the end of a talk he had given in his hometown of Jamestown, New York. At first, the great man was lost for words:

> What does a clergyman say to somebody who asks him to explain the reasons for religion? What does a teacher tell a boy who wants to know what good is reading? Or a parent, should anyone ask him to list the values of a baby to parents, the human race, creation?

After his initial hesitation, Peterson begins by enumerating the various reasons for the existence of birds, divided into the two categories identified by another American ornithologist, Dean Amadon: "on the one hand, aesthetic, personal, impractical; on the other, utilitarian."

The latter category is, of course, easy to answer. Peterson points to the science of ornithology, and how it teaches us so much about the living world, and, indirectly, about our own lives. He notes the economic value of birds: the money spent on hunting and watching them; and the incalculable benefits to human civilisation of the domestication of birds. He mentions the widespread keeping of birds as pets, an area beginning to shade into the former category: "the aesthetic, personal, impractical" aspect of birds.

Then, finally, he takes the gloves off and makes a spirited defence of the 'use' of birds purely for the interest, pleasure and entertainment of birders. In this he follows in a long tradition of the defence of the pastime of birding as more than just a mere hobby. Peterson's friend and colleague, the great British ornithologist James Fisher, summed it up when he made a characteristically wry comment on the nature of birding at the start of his book *Watching Birds*:

> The observation of birds may be a superstition, a tradition, an art, a science, a pleasure, a hobby, or a bore; this depends entirely on the nature of the observer. **[2]**

In recent years, writers and observers have become more aware of the philosophical basis of birding; coinciding with a heightened interest in the benefits that an interest in nature as a whole can bring to people's mental health and emotional well-being **[3]**.

In Western societies in particular, increased affluence over the past few decades has paradoxically led to higher levels of stress, mental health problems and general unhappiness, summed up in the memorable title of a book by psychologist Oliver James: *Affluenza* **[4]**. James identifies this as a problem with people's 'emotional immune system', which can only be cured if they can reconnect with things that really matter.

Another, growing fear, is that generations of modern children may be suffering from what has been termed 'Nature-deficit Disorder'—a lack of unmediated, spontaneous contact with the natural world **[5]**. Things that older generations took for granted—fishing for tiddlers, picking wild flowers, collecting natural objects for a nature table at school—are being denied to many of today's children. As a result, we are raising children who appear to be suffering from a whole range of physical, mental and psychological problems.

Meanwhile, for adults in the Western world, where religion and spirituality are generally on the decline, a passion for the natural world appears to be helping to fill the void. A 2003 report from English Nature, *Nature and Psychological Well-being* **[6]**, analysed how connecting with the natural world not only brings benefits for people's physical health, but can greatly improve their emotional, mental and spiritual health too:

> The natural world offers the potential for significant positive affect on individual and community psychological well-being.

These include the reduction of negatives, such as stress and anxiety; as well as more positive aspects, such as increase in people's attention span and the strengthening of relationships and communities; and wider benefits such as improving local environments.

Although the report was mainly concerned with general 'outdoor activities' such as outdoor play, country walks and wildlife gardening, there is no doubt that a focused activity such as birding would bring the same, if not even greater, benefits to the individual and their community. As a similar study by the US Academy of Leisure Sciences, *The Benefits of Leisure* **[7]**, noted:

> Evidence is mounting that that systems of social support and companionship contribute to a longer, more disease-free, and higher quality life. Certainly many of these systems rely, or are highly dependent, on leisure opportunities… the "social good" of leisure is truly staggering.

This is something many birders have known about—subconsciously or consciously—for a long time. Few people can spend any length of time engaged in watching birds without at some point musing on why they do it; and most will have come to the same conclusion—that a life with birds is better, on the whole, than one without them. As Peterson's essay concludes:

> The truth of the matter is, the birds could very well live without us, but many—perhaps all—of us would find life incomplete, indeed almost intolerable, without the birds.

I—and I imagine every reader of this essay—would wholeheartedly agree.

Stephen Moss

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Finally, I should like to dedicate the essay to the man who had more influence over the development of birding in the 20th century than any other, and whose foresight, wit and intelligence are evident from the quotations used here: Max Nicholson.

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Introduction to Volume 14

The present volume contains an unusually high number of complicated issues of contentious nomenclature. This is not the place for an exhaustive examination of each case, and we apologize to readers if we only touch rather briefly on some of the main arguments affecting the cases that we consider to require special mention here.

Over the years, there has been little consensus as to the family placement of the White-winged Chough (*Corcorax melanoramphos*) and the Apostlebird (*Struthidea cinerea*), with the species being variously placed in Corvidae, Grallindae, each in its own monospecific family, or, as here, together in a family of two species. The name used for this two-species family has normally been Corcoracidae, but the name Struthideidae is actually slightly older. Given the taxonomic chopping and changing that has gone on, Corcoracidae can not be considered a particularly well-established concept in the literature, so it has been deemed more appropriate to follow strict priority and use the name Struthideidae.

In the case of the butcherbird family, the name Streperidae actually appeared one year before the name Cracticidae. However, Bock (1994) explains that through synonymy the latter takes priority from the earlier name Baritidae, with the result that Cracticidae is the name that should be used, as indeed it has been universally in recent times, for this taxon.

The type genus for the bird-of-paradise family has traditionally been given as *Paradisaea*. However, two different spellings appeared in the original description and David *et al.* (2009) have shown that Linnaeus himself acted as the First Reviser and selected the spelling *Paradisea*. Under the current (1999) International Code of Zoological Nomenclature, the concept of prevailing usage is not applicable in the case of two different original spellings. However, in view of the extensive use of the form *Paradisaea*, and the fact that the spelling of this name could have implications for the spelling of the family name, Paradisaeidae, Mary LeCroy and Richard Schodde (*in litt.*) have been working on an application to the Commission calling for formal protection of the spelling *Paradisaea*. As a result, for the purposes of HBW it was considered inappropriate to adopt a rarely used spelling that might (or might not) shortly be officially rejected.

Another genus name with disputed spelling is that of the Asian glossy starlings, traditionally listed as *Aplonis*. It has been shown that another spelling, *Aplornis*, is actually older, by a matter of about a fortnight. There are those who consider *Aplonis* to be a junior synonym of *Aplornis*, whereas others (including the HBW editors) consider *Aplonis* an incorrect subsequent spelling. However, at present this difference in opinion is immaterial because an application (case 3474) has been filed to the Commission to conserve the name/spelling *Aplonis*. Article 82.1 of the Code requires that prevailing usage must be maintained while a case is under consideration by the Commission. Since this issue first arose, in 1990, several Australian sources have adopted the spelling *Aplornis*, with the result that the case for the prevailing usage of the spelling *Aplonis*, although still overwhelming, is slightly less one-sided than it was in 1990. This highlights one of dangers of the concept of prevailing usage under the current Code: prevailing usage can change; an original spelling can not. There may be two or more spellings that qualify as "original", in which case First Reviser action may be required, but again this should always lead to a single, theoretically indisputable and permanent correct version.

A rather unusual case came up in the present volume affecting a disputed common name. When working on HBW13 we had already covered MacGregor's Honeyeater (*Macgregoria pulchra*). In our initial lists for that volume we had the vernacular name written using the form "Macgregor", but it was pointed out to us that Sir William MacGregor's name should correctly be written with a capital "G". At the time, we checked a number of different sources and came to the conclusion that this was correct. Now, in the present volume, we have MacGregor's Bowerbird (*Amblyornis macgregoriae*). Our lists had the version "MacGregor" when we received the comment

that this name ought correctly to be written with a lower-case "g"! We were determined to get this right, and carried out an extensive search but, although clearly favouring the version "MacGregor", the search did not prove totally conclusive. So emissaries went out to the parish of his birth, and even checked Sir William's gravestone: the name appears all in block capitals, so we were no further forward! Finally, we tracked down letters written by Sir William's widow, Lady Mary. She signed her name "MacGregor", and here, at last, we had what we considered sufficiently definite proof that this was the version that they used themselves, all the more pertinent as the bowerbird was specifically named in honour of Lady Mary. We are very grateful to Margaret Mack and also to June Ellner (University of Aberdeen) for their efforts and help in clarifying the issue.

Continuing our series of essays on assorted subjects related to birds, this volume's foreword is a most welcome piece by Stephen Moss dedicated to the past, present and future of birding, with all its manifold implications. This is unquestionably a subject that offers something for everybody, and we are sure that Stephen's fascinating account will help to settle many aspects in their various contexts.

Once again we include brief definitions of a couple of terms that occur repeatedly in the Status and Conservation sections. As defined by BirdLife International, a "restricted-range species" is one which throughout historical times is reckoned always to have had an overall breeding range of under 50,000 km^2. An Endemic Bird Area (EBA) is an area within which the overlapping breeding ranges of at least two restricted-range species are wholly encompassed. Following the last complete figures (1998), restricted-range species account for some 27% of the world's avifauna, or about 2600 species, and these are restricted to about 220 EBAs, which in turn support roughly 75% of all globally threatened bird species. They are thus areas of high priority for conservation, all the more so as they tend equally to be centres of endemism for other life forms.

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We are deeply sorry to have to report that one of our authors of the present volume, Ian Rowley, sadly died earlier this year. Ian's place in Australian ornithology is assured, not least for his period as Editor of *Emu*, and for his many books and papers, always written in his hugely readable but authoritative style. Ian and his wife, Eleanor, have been among our most loyal and consistent contributors over many years, starting with the family Cacatuidae way back in HBW4, and including no less than three families in the present volume.It has been both a great pleasure and a privilege to work with them.

PASSERIFORMES

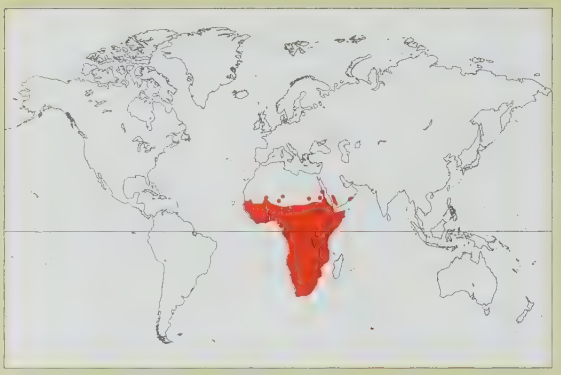
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  - Pittidae (Pittas)
- Furnarii
  - Furnariidae (Ovenbirds)
  - Dendrocolaptidae (Woodcreepers)
  - Thamnophilidae (Typical Antbirds)
  - Formicariidae (Ground-antbirds)
  - Conopophagidae (Gnateaters)
  - Rhinocryptidae (Tapaculos)
- Tyranni
  - Cotingidae (Cotingas)
  - Pipridae (Manakins)
  - Tyrannidae (Tyrant-flycatchers)
- Acanthisittae
  - Acanthisittidae (New Zealand Wrens)
- Menurae
  - Atrichornithidae (Scrub-birds)
  - Menuridae (Lyrebirds)
- Oscines
  - Alaudidae (Larks)
  - Hirundinidae (Swallows)
  - Motacillidae (Pipits and Wagtails)
  - Campephagidae (Cuckoo-shrikes)
  - Pycnonotidae (Bulbuls)
  - Chloropseidae (Leafbirds)
  - Irenidae (Fairy-bluebirds)
  - Aegithinidae (Ioras)
  - Ptilogonatidae (Silky-flycatchers)
  - Bombycillidae (Waxwings)
  - Hypocoliidae (Hypocolius)
  - Dulidae (Palmchat)
  - Cinclidae (Dippers)
  - Troglodytidae (Wrens)
  - Mimidae (Mockingbirds and Thrashers)
  - Prunellidae (Accentors)
  - Turdidae (Thrushes)
  - Muscicapidae (Old World Flycatchers)
  - Platysteiridae (Batises and Wattle-eyes)
  - Rhipiduridae (Fantails)
  - Monarchidae (Monarch-flycatchers)
  - Regulidae (Kinglets and Firecrests)
  - Polioptilidae (Gnatcatchers)
  - Cisticolidae (Cisticolas and allies)
  - Sylviidae (Old World Warblers)
  - Picathartidae (Picathartes)
  - Timaliidae (Babblers)
  - Paradoxornithidae (Parrotbills)
  - Pomatostomidae (Australasian Babblers)
  - Orthonychidae (Logrunners)
  - Eupetidae (Jewel-babblers and allies)
  - ...
  - ...
  - Pachycephalidae (Whistlers)
  - Petroicidae (Australasian Robins)
  - Maluridae (Fairy-wrens)
  - Dasyornithidae (Bristlebirds)
  - Acanthizidae (Thornbills)
  - Epthianuridae (Australian Chats)
  - Neosittidae (Sittellas)
  - Climacteridae (Australasian Treecreepers)
  - Paridae (Tits and Chickadees)
  - Remizidae (Penduline-tits)
  - Aegithalidae (Long-tailed Tits)
  - Sittidae (Nuthatches)
  - Tichodromidae (Wallcreeper)
  - Certhiidae (Treecreepers)
  - Rhabdornithidae (Rhabdornis)
  - Nectariniidae (Sunbirds)
  - Melanocharitidae (Berrypeckers and Longbills)
  - Paramythiidae (Painted Berrypeckers)
  - Dicaeidae (Flowerpeckers)
  - Pardalotidae (Pardalotes)
  - Zosteropidae (White-eyes)
  - Promeropidae (Sugarbirds)
  - Meliphagidae (Honeyeaters)
  - Oriolidae (Orioles)
  - Laniidae (Shrikes)
  - Malaconotidae (Bush-shrikes)
  - Prionopidae (Helmet-shrikes)
  - Vangidae (Vangas)
  - Dicruridae (Drongos)
  - Callaeidae (New Zealand Wattlebirds)
  - Notiomystidae (Stitchbird)
  - Grallinidae (Mudlarks)
  - Struthideidae (Australian Mudnesters)
  - Artamidae (Woodswallows)
  - Cracticidae (Butcherbirds)
  - Pityriaseidae (Bristlehead)
  - Ptilonorhynchidae (Bowerbirds)
  - Paradisaeidae (Birds-of-paradise)
  - Corvidae (Crows)
  - Buphagidae (Oxpeckers)
  - Sturnidae (Starlings)
  - Passeridae (Old World Sparrows)
  - Ploceidae (Weavers)
  - Estrildidae (Waxbills)
  - Viduidae (Indigobirds)
  - Vireonidae (Vireos)
  - Fringillidae (Finches)
  - Drepanididae (Hawaiian Honeycreepers)
  - Parulidae (New World Warblers)
  - Cardinalidae (Cardinals)
  - Thraupidae (Tanagers)
  - Emberizidae (Buntings and New World Sparrows)
  - Icteridae (New World Blackbirds)

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family MALACONOTIDAE (BUSH-SHRIKES)



- Small to medium-sized passerines with robust, usually hooked and toothed bill, and long, lax and erectile rump feathers; plumage black, black and white, or boldly patterned mainly in green, yellow or russet and scarlet; several polymorphic.
- 13–25 cm.



- Africa, one species also in southern Arabia.
- Woodland, scrub and forest, often in farmland and gardens; several species in shrubby grassland, thornveld and semi-desert.
- 8 genera, 48 species, 138 taxa.
- 5 species threatened; none extinct since 1600.

Systematics

Relationships among several Old World groups popularly called "shrikes" have always been problematic. Formerly, the bush-shrikes, African birds, were habitually classified within the family Laniidae, as supposedly fairly close relatives of the "true" shrikes (mainly *Lanius*) and of various other genera with a hook-tipped and "toothed" bill. The first rationale for regarding the bush-shrikes as composing a family of their own, distinct from laniids, was made by W. P. Pycraft in 1907, but avian systematists remained conservative in their outlook for many decades thereafter. In 1960, for example, A. L. Rand, in J. L. Peters's *Check-list of Birds of the World*, treated the bush-shrikes as a subfamily, Malaconotinae, within Laniidae, in which he also included, in addition to the true shrikes, two other subfamilies currently treated as full families, namely the helmet-shrikes (Prionopidae) and the peculiar Bristlehead (Pityriaseidae).

In 1971, the family Malaconotidae was formally erected by the authors of *The Birds of Zambia*, C. W. Benson and colleagues, for the genera *Malaconotus*/*Chlorophoneus*, *Tchagra*, *Laniarius*, *Dryoscopus*, *Nilaus* "and perhaps *Laniotur dus*", this group being characterized by its plumage colours and patterns, loud vocalizations, neat nests, small clutches, woodland habitats, gleaning habits and absence of prey-storing larders. Nevertheless, the bush-shrikes were for many years still retained in Laniidae, usually as a subfamily, by some systematists and by many authors of African regional textbooks. In a series of reports on molecular studies in the 1980s, C. G. Sibley and J. E. Ahlquist demonstrated the ancient phylogenetic link between true shrikes, bush-shrikes and several Australasian taxa, including shrike-tits (*Falcunculus*), shrike-thrushes (*Colluricincla*), cuckoo-shrikes (Campephagidae) and crows (Corvidae), arguing that Australia was the origin of shrike-like lineages that in the late Eocene invaded Asia and Africa. In their radical new classification of birds in 1990, these authors, and Sibley and B. L. Monroe, recognized the differences at a higher taxonomic level between true shrikes, bush-shrikes and helmet-shrikes, placing the first in Laniidae, and the second and third as the respective tribes Malaconotini and Vangini in a subfamily, Malaconotinae, along with six other subfamilies including crows, orioles (Oriolidae), drongos (Dicruridae) and monarch-flycatchers (Monarchidae) in a greatly enlarged family Corvidae. Further, Sibley and Monroe placed the peppershrikes (*Cyclarhis*) and the shrike-vireos (*Vireolanius*) with the vireos (*Vireo*) in the New World family Vireonidae, sequencing them between Laniidae and Corvidae, and they united African helmet-shrikes and Madagascan vangid shrikes with African batises (*Batis*) and wattle-eyes (*Platysteira*), as well as with the two south Asian wood-shrikes (*Tephrodornis*), in the tribe Vangini, next to the tribe Malaconotini.

Meanwhile, T. Harris and G. Arnott analysed 90 characters of plumage, morphology, parasites, behaviour and DNA, following which, in their 1988 work *Shrikes of Southern Africa*, they recognized a single family, Laniidae, comprising the three subfamilies Laniinae, Prionopinae and Malaconotinae, the last two more closely allied to each other than to Laniinae. In this arrangement, the Malaconotinae included two more African gen-



The family Malaconotidae is characterized by its plumage colours and patterns, loud vocalizations, neat nests, small clutches, woodland habitats, gleaning habits, and absence of prey-storing larders. With one exception, bush-shrikes are restricted to Africa. Relationships among the six bush-shrikes of the genus Malaconotus *are subject to disagreement. The Fiery-breasted* (M. cruentus), *Monteiro's* (M. monteiri), *Lagden's* (M. lagdeni) *and* ***Grey-headed Bush-shrikes*** *are very alike in appearance and biology. The Grey-headed, Monteiro's and Lagden's Bush-shrikes are parapatric or allopatric, and are best treated as a superspecies.*

[*Malaconotus blanchoti*, Modimolle, Limpopo, South Africa. Photo: Warwick Tarboton]



The tchagras are a fairly well-defined genus of semi-terrestrial, russet-winged bush-shrikes, smaller than Malaconotus *but with a similarly powerful bite. Most tchagras live in open, dry savanna, with coarse grass and thickets of thorn trees. Four species, including the* ***Three-streaked Tchagra****, are sexually monomorphic and somewhat uniform, but a fifth, the Marsh Tchagra* (Tchagra minutus)*, is sexually dimorphic. The Three-streaked Tchagra forms a superspecies with the Brown-crowned Tchagra* (T. australis)*, with which it has hybridized, and the Southern Tchagra* (T. tchagra)*. Two subspecies of Three-streaked Tchagra are recognized.*

[*Tchagra jamesi jamesi*, Negele, Ethiopia. Photo: Ketil Knudsen]

era, namely the diminutive flycatcher-like *Batis* and *Platysteira*. With improving knowledge, especially with regard to communication characteristics, bush-shrikes and true shrikes are currently seen as being sufficiently distinct to be regarded as separate families, with Malaconotidae more generalized than the specialist-foraging Laniidae.

Malaconotid limits, however, remain controversial. In Volume V of *The Birds of Africa*, edited by E. K. Urban and colleagues and published in 1997, the batises and wattle-eyes, together with the White-tailed Shrike (*Lanioturdus torquatus*) and the two shrike-flycatchers, namely the Black-and-white Shrike-flycatcher (*Bias musicus*) and the African Shrike-flycatcher (*Megabyas flammulatus*), were treated as constituting the family Platysteiridae, related only distantly to Malaconotidae. In Volume VI of *The Birds of Africa*, published in 2000, C. H. Fry and colleagues deemed that the latter family embraced the bush-shrikes of the genera *Malaconotus*, in which they included *Chlorophoneus*, and *Telophorus*, the tchagras, which they treated in two genera (*Antichromus* and *Tchagra*), the puffbacks (*Dryoscopus*), the boubous and gonoleks (*Laniarius*) and the Brubru (*Nilaus afer*); thus, it excluded not only the platysteirids, but also the helmet-shrikes (*Prionops*), which were retained in their own family, Prionopidae.

In the present arrangement, the Malaconotidae, the Platysteiridae and the Prionopidae are still treated as three separate families, since they are such distinctively different birds in



A rather small, large-headed, thickset tchagra with a comparatively short, graduated tail and a bill which is shorter and relatively wider than that of its congeners, the ***Marsh Tchagra*** *also differs in its sexual dimorphism and habitat preference. It is a wetland species, commonest in rank growth at the edges of papyrus swamps, marshes and coastal lagoons. But morphologically and biologically, the differences between the Marsh Tchagra and other tchagras are no greater than the differences among species within other malaconotid genera. The male is shown here; the female is similar, but has a striking, well-defined superciliary stripe from the base of the bill to above the ear-coverts.*

[*Tchagra minutus minutus*, Masindi, Uganda. Photo: Pete Morris]



Several bush-shrike species fluff out the rump feathers in territorial and courtship flight displays, a feature brought to extremes by the puffbacks (Dryoscopus). *There are six species. The* ***Black-backed Puffback*** *forms a southern-tropical superspecies with the Red-eyed Puffback* (D. senegalensis). *There is also a northern-tropical superspecies formed by the Northern Puffback* (D. gambensis) *and Pringle's Puffback* (D. pringlii). *And finally, there are two independent forms, Sabine's Puffback* (D. sabini) *and the Pink-footed Puffback* (D. angolensis).

[*Dryoscopus cubla hamatus*, Lebata Camp, Northern Province, South Africa. Photo: Johannes Ferdinand]

the field. The enigmatic White-tailed Shrike, included in Malaconotidae for administrative reasons, is, in fact, closer in its affinities to the batises, a conclusion given strong support by recent studies of molecular systematics by P. Beresford and colleagues. The definitive analyses of shrike characters presented in 2000 by Harris and K. Franklin in *Shrikes and Bush-shrikes* does, however, indicate that platysteirids and prionopids are more closely allied with bush-shrikes than is suggested by field appearances and behaviour. These authors recognize solely the two families Laniidae and Malaconotidae, the second consisting of 18 African and Asiatic genera dealt with in the sequence *Malaconotus*, *Chlorophoneus*, *Telophorus*, *Rhodophoneus*, *Laniarius*, *Dryoscopus*, *Antichromus*, *Tchagra*, *Tephrodornis*, *Megabyas*, *Bias*, *Philentoma*, *Nilaus*, *Lanioturdus*, *Batis*, *Platysteira*, *Dyaphorophyia* and *Prionops*.



The family Malaconotidae, as currently delimited, is restricted almost entirely to Africa. Only the Black-crowned Tchagra (*Tchagra senegalus*), which has a wider range within sub-Saharan Africa than any other bush-shrike, extends into Arabia, where it occurs in Yemen and in the Dhofar province of Oman; it is also the only bush-shrike that ranges north of the Sahara.

If there has been little consensus about family limits, there was formerly even less agreement about generic limits. Several bush-shrike species have, since their initial discovery, been shunted to and fro among four or five of the genera listed above. Currently, however, there appears to be no disagreement over the boundaries of *Laniarius* and *Dryoscopus*, nor about the validity of the monotypic *Nilaus* and *Lanioturdus*. *Laniarius* is discussed in detail below. *Dryoscopus* has six species, all sexually dimorphic, with pied males and brown females, and rather uniform in character. The genus consists of a northern-tropical superspecies composed of the Northern Puffback (*Dryoscopus gambensis*) and Pringle's Puffback (*Dryoscopus pringlii*), a southern-tropical superspecies formed by the Red-eyed Puffback (*Dryoscopus senegalensis*) and the Black-backed Puffback (*Dryoscopus cubla*), and two independent forms, Sabine's Puffback (*Dryoscopus sabini*) of West Africa and the equatorial Pink-footed Puffback (*Dryoscopus angolensis*). The Brubru, in the monotypic genus *Nilaus*, is genetically basal in malaconotid phylogeny. It is arboreal and widespread, with seven little-differentiated subspecies north and south of two distinctive ones; the nest, the white back and the fluffy white rump of the Brubru are features also of the Platysteiridae, and the species may link the two families. Similarly, the enigmatic, monotypic, terrestrial White-tailed Shrike, the sole member of the genus *Lanioturdus* of semi-arid south-west Africa, also links the families, and is often treated in the Platysteiridae, rather than in the Malaconotidae.

The odd Rosy-patched Shrike (*Telophorus cruentus*) of arid north-eastern Africa, Linnaeus's *Lanius cruentus*, was placed in *Tchagra* in E. Mayr and J. C. Greenway's *Check-list of Birds of the World*, in 1960, and for many years thereafter it landed in its own genus, *Rhodophoneus*. It is now thought to be closest to the southern African Bokmakierie (*Telophorus zeylonus*), and is currently treated as congeneric with it. The congeners of these two species, the Gorgeous Bush-shrike (*Telophorus viridis*) and Doherty's Bush-shrike (*Telophorus dohertyi*), are smaller birds

The puffbacks are all sexually dimorphic, with pied males and less contrastingly coloured females. Differing from the glossy bluish-black forehead, hindneck and mantle of the male, the upperparts of the nominate female of the ***Northern Puffback*** *are medium grey or greyish-brown. Where the male's underside is a creamy greyish-white, the female is predominantly rufous. The five races of the Northern Puffback differ mainly in the plumage of females. That of the female of race* erythreae *is notable in that it resembles the plumage of the male, but the upperparts are dark chocolate-brown as opposed to the male's bluish-black.*

[*Dryoscopus gambensis gambensis*, Bauchi, NE Nigeria. Photo: A. P. Leventis]

Laniarius, *containing the boubous and gonoleks, is the most species-rich malaconotid genus, with 19 species. Morphologically, they are strikingly similar, but they vary in plumage colour and pattern. Nine, including the* ***Swamp Boubou****, are white or buff below and black above, and four are entirely black. Six, including the* ***Crimson-breasted Shrike****, are black above and bright scarlet or yellow below. Some are dimorphic in plumage. Biologically the genus is rather uniform, but the species differ in habitat preferences. The Swamp Boubou lives in woody swamps, mangrove and papyrus, the Crimson-breasted Shrike in acacia woodland or thornveld. In 2008, genetic analyses of* Laniarius *species threw conventional wisdom about the systematics and phylogeny of the genus into some disarray, indicating how misleading opinions based on features such as plumage colour and pattern can be, even when they seem to be corroborated by geographical distribution, and by such characters as voice, and even by morphology. Four black-and-scarlet species have been regarded as so closely related as to constitute a superspecies. However, the DNA analysis provided evidence that the Crimson-breasted Shrike represents a much deeper branch than the others, and hence is only distantly related to them; it may be closer to the all-black Sooty Boubou* (L. leucorhynchus) *than to any other congener. The Swamp Boubou has been treated as a race of the Southern Boubou* (L. ferrugineus). *The DNA analyses indicate that this species is indeed closest to* L. ferrugineus, *and to the East Coast Boubou* (L. sublacteus), *the three composing a sister lineage to two more black-and-white (or buff) species, the Tropical Boubou* (L. aethiopicus) *and Turati's Boubou* (L. turatii).

[Above: *Laniarius bicolor sticturus*, Okavango Delta, Botswana.

Below: *Laniarius atrococcineus*, Nylstroom, South Africa. Photos: Warwick Tarboton]







Nearly all taxonomists have believed the four all-black Laniarius *bush-shrikes to be very closely allied, forming a distinctive lineage within the genus. Recent DNA analysis, however, indicates that they represent three branches arising on the* Laniarius *tree trunk at different times, and separated by branches giving rise to other congeners. The* ***Slate-coloured Boubou*** *constitutes the latest branch. The Sooty Boubou* (L. leucorhynchus) *forms a deep branch in the phylogeny; the Mountain Boubou* (L. poensis) *and Fülleborn's Boubou* (L. fuelleborni) *form a later branch, and are not even close enough to each other to compose a superspecies, as was previously thought.*

[*Laniarius funebris funebris*, Tarangire National Park, Tanzania. Photo: Dave Richards]

of montane and lowland forest, and are close enough to form a superspecies. The former is often regarded as consisting of two species, the green-bellied nominate race in western parts of Africa being treated as distinct from the three eastern subspecies, which have the belly yellow. *Tchagra* itself is a fairly well-defined genus of middle-sized, semi-terrestrial, russet-winged, open-country bush-shrikes. Four of the tchagras are sexually monomorphic and somewhat uniform, but a fifth, the Marsh Tchagra (*Tchagra minutus*), is sexually dimorphic and, mainly for that reason, has sometimes been awarded its own genus, *Antichromus* or *Bocagia*.



In Peters's *Check-list of Birds of the World*, the genus *Telophorus* comprised ten species, six of which have frequently been separated into *Chlorophoneus*. One of the six, the Endangered and little-known Mount Kupe Bush-shrike (*Chlorophoneus kupeensis*), is atypical, intermediate in character between *Chlorophoneus* and *Malaconotus*, and perhaps should be removed into a genus of its own. In fact, *Chlorophoneus* has been united with *Malaconotus* in several systematic works, including C. M. N. White's *A Revised Check List of African Shrikes, Orioles, Drongos, Starlings, Crows, Waxwings, Cuckoo-shrikes, Bulbuls, Accentors, Thrushes and Babblers*, published in 1962, *An Atlas of Speciation in African Passerine Birds* by B. P. Hall and R. E. Moreau, in 1980, *A Contribution to the Distribution and Taxonomy of Afrotropical and Malagasy Bird Species* by R. J. Dowsett and F. Dowsett-Lemaire, in 1993, and the sixth volume of the handbook *The Birds of Africa*, published in 2000.

Differences between *Chlorophoneus* and *Malaconotus* are outweighed by their similarities. The former, without *Chlorophoneus kupeensis*, are small-bodied and slender-billed birds, whereas the latter are large, being two to three times as heavy, and robust-billed; juveniles of *Chlorophoneus* are barred, while those of *Malaconotus* are plain; and the vocalizations of the two genera differ somewhat, although they resemble each other more than either resembles the voices of other bush-shrikes. Both groups, however, are colourful, several species being polymorphic in plumage, the colours varying geographically in an intriguingly congruous manner. It is hardly surprising that they have all been regarded as congeneric, yet an analysis of mitochondrial DNA by J. Fuchs and co-workers in 2005 suggests that the main malaconotid genera fall into two deeply divided clades, with *Malaconotus sensu stricto* in one clade and *Chlorophoneus* in the other. The first clade contains *Malaconotus*, *Tchagra*/*Antichromus* and *Dryoscopus*, and the second *Telophorus*, *Chlorophoneus* and *Laniarius*. The same study also figures a maximum-likelihood tree for nuclear myoglobin, which gives similar results except that *Dryoscopus* falls into the second clade, close to *Laniarius*. A more recent cladistic analysis of both nuclear-DNA and mitochondrial-DNA sequences of the main genera except *Malaconotus*, undertaken by B. Nguembock and colleagues in 2008, indicates much the same, the resulting clades being *Tchagra* and *Dryoscopus* on the one hand and, on the other,

In 1988, a strange bush-shrike was found at Bulo Burti, in Somalia. In 1991, it was described as a new species, Laniarius liberatus, *the "Bulo Burti Boubou". Controversy about its taxonomic status continued; was it an aberrant Tropical Boubou* (L. aethiopicus), *or perhaps a hybrid between the* ***Somali Boubou*** *and the Red-naped* (L. ruficeps) *Bush-shrike? In 2008, DNA analysis of the bird's moulted feathers settled the question. It was practically identical to, and conspecific with, the Somali Boubou, constituting just a well-marked morph. The Somali Boubou is a recently recognized species, previously treated as a subspecies of the Tropical Boubou.*

[*Laniarius erlangeri*, Bulo Burti, Somalia. Photo: Ed Smith]



The Chlorophoneus *bush-shrikes are mostly small-bodied and slender-billed. The Many-coloured* (C. multicolor) *and Black-fronted Bush-shrikes* (C. nigrifrons) *are highly polymorphic, and form a superspecies. The* ***Olive Bush-shrike*** *and Bocage's Bush-shrike* (C. bocagei) *seem to be closely allied. Five subspecies of Olive Bush-shrike are recognized. The nominate race occurs in two colour morphs, which may be two formerly allopatric races beginning to intergrade. The olive morph differs from the buff morph, shown here, in having the whole of the upperside bright olive-green, lores and supercilium greenish-yellow, the belly and undertail-coverts greenish-yellow, and the flanks bright green.*

[*Chlorophoneus olivaceus olivaceus*, Plettenberg Bay, South Africa. Photo: Geoff McIlleron]

Telophorus, *Chlorophoneus* and *Laniarius*. It would appear, therefore, that *Malaconotus* and *Chlorophoneus* are not synonymous with each other after all, nor even are they closely related.

There is little agreement about relationships among the six *Malaconotus* bush-shrikes. They have been regarded variously as a single polymorphic species, as a single superspecies, and as various combinations of superspecies and independent species. With the exception of the savanna-woodland Grey-headed Bush-shrike (*Malaconotus blanchoti*), all of them inhabit forest. The Grey-headed, Fiery-breasted (*Malaconotus cruentus*), Monteiro's (*Malaconotus monteiri*) and Lagden's Bush-shrikes (*Malaconotus lagdeni*) are very alike in appearance and biology; the restricted-range Green-breasted (*Malaconotus gladiator*) and Uluguru Bush-shrikes (*Malaconotus alius*) are more distinctive, at least in coloration. Of the four lookalikes, the Grey-headed, Monteiro's and Lagden's Bush-shrikes are parapatric or allopatric, and are therefore best treated as constituting a superspecies; the Fiery-breasted Bush-shrike, being sympatric with Lagden's Bush-shrike, should be regarded as an independent species, even though the two are alike vocally. The little-known Monteiro's Bush-shrike has populations in north-western Angola and western Cameroon, although the latter may prove to be a colour variant of a congener, the Fiery-breasted, Grey-headed and Green-breasted Bush-shrikes having been proposed as candidates. Most or all Fiery-breasted Bush-shrike populations vary in the degree of orange, red or scarlet infusion in the yellow underparts, and the species may yet be found to be polymorphic, rather than polytypic.

Without the atypical Mount Kupe Bush-shrike, the genus *Chlorophoneus* consists of four forest-dwelling species and one savanna-woodland species. Bocage's Bush-shrike (*Chlorophoneus bocagei*) and the Olive Bush-shrike (*Chlorophoneus olivaceus*) seem to be closely allied, and the highly polymorphic Many-coloured (*Chlorophoneus multicolor*) and Black-fronted Bush-shrikes (*Chlorophoneus nigrifrons*) form a superspecies and are often regarded as conspecific. The savanna-inhabiting Orange-breasted Bush-shrike (*Chlorophoneus sulfureopectus*) is probably quite closely related to the Many-coloured and Black-fronted Bush-shrikes, although its plumage bears a greater resemblance to that of the much larger Grey-headed Bush-shrike, fully sympatric with it throughout Africa's savanna woodlands.

There is an extraordinary regional parallelism in colouring between the large, mainly monomorphic *Malaconotus* species on the one hand and the small, polymorphic *Chlorophoneus* bush-shrikes on the other. One species in each genus inhabits savanna woodlands; these are the large Grey-headed Bush-shrike and the small Orange-breasted Bush-shrike, and their plumages are strikingly similar. In lowland forests, the underparts of the large Fiery-breasted Bush-shrike, in *Malaconotus*, vary in any one population, and they vary also regionally. Some individuals of this species in Sierra Leone and many in Cameroon have the chin orange-yellow, the throat and breast bright orange-red, the upper belly orange, and the lower belly, flanks, thighs and undertail-coverts bright yellow; the population on Mount Nimba, in Liberia, is rather uniform, with an orange suffusion in the underparts paler and less extensive. In south-western Cameroon the breast is sometimes yellow, and half of the Fiery-breasted Bush-shrike population around Kumba has the breast yellow-orange and the other half has it red-orange; most of those in Gabon and DRCongo have a bright orange chin and throat, a red-orange or scarlet breast, and a yellow belly and undertail-coverts. The small, highly polymorphic Many-coloured Bush-shrike, representing the genus *Chlorophoneus*, has much the same geographical distribution as that of the Fiery-breasted Bush-shrike and looks much like the latter, except that it possesses a black mask and dark eyes. It has five main colour morphs and six intermediate types occurring in varying proportions throughout its range, with a tendency for the colour of the underparts of the predominant morph in a particular locality to match that of Fiery-breasted Bush-shrikes there. Moreover, Many-coloured Bush-shrikes in north-west Angola seem to be largely yellow-breasted, matching the *Malaconotus* species, Monteiro's Bush-shrike, in the area. It is, in fact, quite possible that Monteiro's Bush-shrike is itself a colour variant of the Fiery-breasted Bush-shrike, rather than an allospecies of the Grey-headed Bush-shrike.

Black-fronted Bush-shrikes, in *Chlorophoneus*, are mostly red-breasted in Kenya and northern Mozambique and mostly orange-breasted in Zambia. There are no *Malaconotus* species in these countries but, in eastern Tanzania, Uluguru Bush-shrikes occur in the mountains of that name. They have greenish-yellow underparts, and nearly all of the Black-fronted Bush-shrikes in Tanzanian lowlands are of either the yellow or the buff morph.



The relatively small-billed ***Doherty's Bush-shrike*** *forms a superspecies with the Gorgeous Bush-shrike* (Telophorus viridis). *Both have conventionally been grouped in* Chlorophoneus, *but studies of nuclear and mitochondrial DNA support their placement in* Telophorus, *albeit closer to* Chlorophoneus *and* Laniarius *than the clade formed by* Malaconotus, Dryoscopus *and* Tchagra. *Doherty's Bush-shrike occurs in two colour morphs, the crimson, shown here, and the rarer yellow, in which the crimson face is replaced with bright yellow. The remaining two* Telophorus *species are larger and heavier. The Rosy-patched Shrike* (T. cruentus) *once had its own genus but is now thought to be closest to the Bokmakierie* (T. zeylonus).

[*Telophorus dohertyi*, Mount Elgon National Park, Kenya.
Photo: Günter Ziesler]

Olive Bush-shrikes and Doherty's Bush-shrikes, in the respective genera *Chlorophoneus* and *Telophorus*, are both dimorphic in plumage; no *Malaconotus* species occurs in either of their separate ranges, and they are not implicated in colour convergences. Hall and colleagues analysed the situation in 1966; they concluded that parallelisms are due to the fact that *Malaconotus* and *Chlorophoneus* are very closely allied and share genomes that have expressed themselves similarly in phenotypes under similar selection pressures in similar environments, and that the essentially monomorphic *Malaconotus* species may have derived directly from ancestral stock that was polymorphic. It should be pointed out here that *Malaconotus* would contain one dimorphic species if Monteiro's Bush-shrike proved to be a colour morph of the Fiery-breasted Bush-shrike, as Hall and colleagues proposed. As for the genetic mechanisms involved, these scientists found polymorphism in *Chlorophoneus* to be accounted for by three genes, each with two alleles. They discussed the possibility that colour patterns of *Malaconotus* species might have a selective value in warning potential predators that these robust bush-shrikes with a strong, predatory bill are well able to defend themselves, and that *Chlorophoneus* species have gained protection from the same field of predators by evolving mimicry of their large, better-protected sympatric relatives. This is the well-understood principle of aposematic coloration, whereby vulnerable mimics converge evolutionarily upon warningly patterned models. Unfortunately, the principle demands that mimics be much rarer than models, which is not the case in this instance; the convergence could prove to be an example of some other form of mimicry, such as that of *Accipiter* sparrowhawks by *Cuculus* cuckoos discussed by N. B. Davies and J. A. Welbergen in their 2008 paper. There remain other difficulties, too, not least that, as now appears to be the case, the two genera are not at all closely related within the family. Knowledge of the biology of *Malaconotus* and *Chlorophoneus* species has not improved greatly since the 1966 review, and an understanding of their convergences is unlikely to be advanced until field research reveals far more about intraspecific and, particularly, interspecific ecological, social and communication attributes.

Laniarius is by far the largest malaconotid genus, with 19 species. Morphologically, these are strikingly similar, but they vary in plumage colour and pattern. Four are entirely black, six are black above and bright yellow or scarlet below, with or without a coloured crown and a white wingstripe, and the remainder are white or buffy below and black above, with or without a white wingstripe. Some are dimorphic in plumage. Biologically, too, the genus is rather uniform, but the species differ in habitat preferences, living in forest, mesic woodland or thornbush canopy or lower levels, with some almost terrestrial, and in woody swamps, mangrove and papyrus (*Cyperus papyrus*). Most authorities have grouped the majority of these species into a number of superspecies, the limits of nearly all of them being a matter of opinion. In 2008, genetic analyses of *Laniarius* species by Nguembock and co-workers threw conventional wisdom about the systematics and phylogeny of the genus into disarray. Studying two mitochondrial genes and a nuclear-DNA intron sequence in 16 species and 34 subspecies, the researchers drew up three broadly similar phylogenetic trees, using five other malaconotid genera as outgroups. The results include the following unexpected revelations, which indicate uncomfortably how misleading appraisals of features such as plumage colour and pattern can be, even when they seem to be corroborated by geographical distribution and by such characters as voice and morphology.

Nearly all taxonomists have believed the four all-black *Laniarius* bush-shrikes to be very closely allied, forming a distinctive lineage within the genus, but it now seems that they represent three branches arising on the *Laniarius* tree trunk at different times and separated by branches giving rise to other congeners. The Sooty Boubou (*Laniarius leucorhynchus*) forms a deep branch in the phylogeny; the Mountain Boubou (*Laniarius poensis*) and Fülleborn's Boubou (*Laniarius fuelleborni*) form a later branch and are not even close enough to each other to compose a superspecies, although hitherto generally thought to do so; and the Slate-coloured Boubou (*Laniarius funebris*) constitutes a still later branch. A branch arising from the trunk between the older *poensis–fuelleborni* lineage and the more recent *funebris* carries two Horn of Africa endemics, the Red-naped Bush-shrike (*Laniarius ruficeps*) and the newly recognized Somali Boubou (*Laniarius erlangeri*).

Four black-and-scarlet species have been widely regarded as being so closely related as to constitute a superspecies, to which the Yellow-breasted Boubou (*Laniarius atroflavus*) has often been added. Nguembock and colleagues, however, have provided



*The **Brubru** is placed in the monotypic genus* Nilaus. *Its nest and some plumage features are very like those of the batises* (Batis), *but many aspects of its behaviour are typical of Malaconotidae, and the Brubru may link the two groups. Along with Pringle's Puffback* (Dryoscopus pringlii), *at 12·5–15 cm and 13–27 g it is among the smallest of the malaconotids. The Brubru occurs in a wide range of habitats, from the canopy of broadleaf woodland to flat-topped acacia woods, and scrub in arid environments. In Botswana, it occurs in 11 out of 17 woodland types. It is widespread, with seven little-differentiated subspecies north and south of two distinctive ones. Brubrus have thick rump feathers, speckled black and white, but do not fluff them out.*

[*Nilaus afer massaicus*, Chyulu Hills, Kenya. Photo: Morten Strange]

strong evidence that the Crimson-breasted Shrike (*Laniarius atrococcineus*) represents a much deeper branch than the others and hence is only distantly related to them; in fact, it may be closer to the Sooty Boubou than to any other congener. Genetically, the Yellow-breasted Boubou is quite closely allied to the Papyrus Gonolek (*Laniarius mufumbiri*), the two being sisters to the superspecies consisting of the Yellow-crowned (*Laniarius barbarus*) and Black-headed Gonoleks (*Laniarius erythrogaster*). In each pair, one species is yellow-crowned and the other is black-crowned, invalidating the taxonomic significance of that particular character. Similarly, the presence or absence of a white stripe in the black upperwing in this lineage in the Tropical Boubou (*Laniarius aethiopicus*) cluster, as well as in the genus *Dryoscopus*, is of little or no taxonomic value.

Among a group of boubous with black upperparts and white or buff underparts, all except one, Turati's Boubou (*Laniarius turatii*), have a long white stripe in the black wing. They are the wide-ranging Tropical Boubou, extending in several races from Senegal east to Eritrea and north-western Somalia, and south to central Angola and northernmost South Africa; the Southern Boubou (*Laniarius ferrugineus*), with six races in southern Africa, the Tropical and Southern Boubous being parapatric and intergrading where they meet in the Limpopo valley; Turati's Boubou in Guinea-Bissau, Guinea and Sierra Leone, parapatric with the Tropical Boubou; and the Swamp Boubou (*Laniarius bicolor*), with three subspecies along the mangrove coasts from Cameroon south to Angola, and inland through the valleys of the River Cunene and River Cubango into Zambia, Namibia and Botswana. These four are closely related, forming one lineage or clade, and often thought of as composing a single superspecies; the clade is sister to a not very closely allied clade consisting of Lühder's Bush-shrike (*Laniarius luehderi*) and its two circumscribed allospecies, Braun's (*Laniarius brauni*) and the Gabela Bush-shrikes (*Laniarius amboimensis*). A surprising find is that the species named as the East Coast Boubou (*Laniarius sublacteus*), embedded in the range of the Tropical Boubou and hitherto held to be a race of it, is in fact more closely related to the Southern Boubou, although not so closely as to be conspecific with it. The East Coast Boubou has a wholly black morph, but the Tropical and Southern Boubous do not. Remarkably, a single specimen from the Arabuko-Sokoke Forest, well within the range of the East Coast Boubou, appears to be genetically very closely related to Turati's Boubou, found on the other side of the continent.

A further revelation is that a poorly known population in south-east Somalia which has been widely regarded as a race of Tropical Boubou is, in fact, only distantly related to the younger "Tropical Boubou complex", to the Lühder's Bush-shrike superspecies, and to the four species making up the "Yellow-crowned Gonolek group". Named the Somali Boubou and el-

*The **White-tailed Shrike**, the sole member of the genus* Lanioturdus, *has a plumage pattern and nest strongly reminiscent of batises* (Batis); *it also shares some structural characters, like jaw musculature, with both batises and wattle-eyes* (Platysteira), *and may belong with them in the family Platysteiridae, rather than in Malaconotidae. A largely terrestrial forager, the White-tailed Shrike has long legs, where those of the other malaconotids are of medium length. Small for a bush-shrike, at 14–15 cm and 23·5–45 g, it has a large head which can appear crested, and a short tail. The sexes are alike, the male perhaps fractionally larger. Its rump feathers and uppertail-coverts are long and fluffy*

[*Lanioturdus torquatus*, Etosha National Park, Namibia. Photo: Peter Craig-Cooper/ VIREO]





Bush-shrikes are retiring birds which skulk in undergrowth, on shady ground beneath it, and within canopy foliage. They are rarely observed in the open for any length of time, and little appears to have been recorded of aspects such as comfort behaviour, preening, scratching, water-bathing and dust-bathing. The ***Southern Boubou*** *normally keeps low down in dense, woody vegetation, but this one has come into the open to sunbathe. Some boubous break their generally secretive habits around human dwellings, hopping around the edges of sunny lawns in leafy suburbs.*

[*Laniarius ferrugineus ferrugineus*, Nature's Valley, Western Cape, South Africa. Photo: Peter J. Ginn]

evated to species rank as *Laniarius erlangeri*, its closest relative is evidently another rather poorly known Horn of Africa species, the Red-naped Bush-shrike. The pair compose a deep branch or clade between the older black boubous *L. poensis* and *L. fuelleborni* and the younger black *L. funebris*; interestingly, the Somali Boubou has an all-black morph.

In 1988, a strange bush-shrike was found at Bulo Burti (Buulobarde), in Somalia. It was caught, taken to Europe, and returned to Somalia, where it was released into Balcad Nature Reserve, near Mogadishu; it was not seen again. In 1991, it was described as a new species, *Laniarius liberatus*, the "Bulo Burti Bush-shrike" or "Bulo Burti Boubou". This promoted lengthy debate on the propriety of naming a taxon without the existence of a museum type specimen, as well as controversy about its taxonomic status. Was this bird an aberrant Tropical Boubou, or perhaps a hybrid between the Somali Boubou and the Red-naped Bush-shrike? Several works, including *The Birds of Africa* volume VI and *Shrikes and Bush-shrikes*, continued to treat it as a valid species, but the molecular-genetic analyses by Nguembock and colleagues in 2008 indicate otherwise. These researchers, having analysed DNA extracted from the bird's moulted feathers, show emphatically that the Bulo Burti Bush-shrike was not a hybrid but was, perhaps surprisingly, almost identical to and conspecific with the Somali Boubou.

Morphological Aspects

In the majority of structural respects, malaconotid shrikes are somewhat unexceptional passerines. They vary in size from Pringle's Puffback and the Brubru, at only about 15 cm in length and 15–30 g in weight, up to the members of the genus *Malaconotus*, the largest of which is the Green-breasted Bush-shrike, measuring up to 28 cm in length and to 100 g in weight. Most species weigh about 40 g.

In the field the smaller bush-shrikes do not look particularly strong, although some are rather bull-headed, and in the hand they do not feel especially robust or full of fight. They have the build of a large *Sylvia* warbler and, like the latter, they creep about in vegetation. So, too, do the larger species, which are, however, decidedly bull-headed, with a heavy, black, hooked-tipped bill much like that of *Lanius* shrikes in shape, with a notch in the cutting edge of the upper mandible just behind its tip. Tchagras and, particularly, *Malaconotus* bush-shrikes have a powerful bite, but the bite of *Dryoscopus* and *Chlorophoneus* species is weaker, as befits birds with bills and eating habits more similar to those of a *Turdus* thrush than those of a shrike. In *Malaconotus*, the bill, measured from its tip to the corner of the mouth, is about the same in length as the rest of the head. All of these species have a row of rictal bristles, generally four, on each side of the gape, longest and strongest in *Malaconotus*, which also have small nasal bristles. Observations on the function of rictal bristles were made by M. Dyer, who fed large grasshop-



This ***Tropical Boubou*** *has just emerged from bathing. Usually keeping to the cover of dense thickets, elephant grass, tangled creepers or the unkempt hedges of farms and gardens, Tropical Boubous are inquisitive and can become quite confiding, coming into the open in large gardens and around game lodges. They also emerge after the rain to forage in roadside drains or wet silt along paths. Bush-shrikes live in pairs throughout the year, in territories which they defend by singing and displays. They fly reluctantly, travelling short distances low over the ground, with fast wing-flapping until the bird is about to alight, or fluttering briefly into the air in pursuit of an insect.*

[*Laniarius aethiopicus major*, Karatu, Tanzania. Photo: Anabel Harries]

pers of the genus *Acanthacris* to a captive Black-crowned Tchagra. These grasshoppers have formidable-looking tibial spines on the hind legs and, when the shrike seized an insect, the legs invariably struck out at the bird's face but were deflected away from its eyes by the stiff rictal bristles.

The neck of the Malaconotidae is short. Lühder's Bush-shrike and probably several of its relatives have the neck skin thickened and distensible, which is likely to be an adaptation for inflation of the neck when the bird calls. The wings are rounded and the primaries curved, with projections of only 10–20 mm beyond the tips of the folded secondaries, while the tail is mainly of medium length, narrow, and rounded or graduated. The tail of the White-tailed Shrike is very short, but this species, as mentioned above (see Systematics), may not be a malaconotid at all but, rather, a terrestrial platysteirid.

The legs of the White-tailed Shrike are long. Those of the remainder of the family are of medium length, not so strong as might be expected of these semi-predatory birds, many of which are quite terrestrial. The feet are scutellate, with the tarsi booted or sparsely scutellate; in the case of the Brubru, another taxonomically enigmatic bird, the pattern of scutellation is akin to that found in helmet-shrikes. The members of the genera *Chlorophoneus* and *Telophorus* have the toes somewhat fused at their bases. Relatively little variation is apparent in the colour of the bare parts of malaconotids. The legs are brownish grey-black in all except one species, the Pink-footed Puffback, which, for some odd reason, has pink or violet legs and feet. So far as is known, the palate is black in all malaconotid species except for the Mount Kupe Bush-shrike, in which it is orange or yellow. The iris of most bush-shrikes is blackish or dark reddish-brown, but it is yellow or pale bluish-grey in all except one of the *Malaconotus* species, red in four out of the six species of puffback, white in the Black-headed Gonolek, and pale yellow in the Papyrus Gonolek and the White-tailed Shrike. The single exception in *Malaconotus* is the Uluguru Bush-shrike, which has dark reddish-brown eyes, rather than pale blue-grey or yellow ones. In the Pink-footed Puffback, the edge of the sclerotic membrane is bright blue and the rim of the eyelids is dusky, tinged with red. Crimson-breasted Shrikes have greyish-brown eyes with a narrow ring of pale violet, whereas Brown-crowned (*Tchagra australis*), Three-streaked (*Tchagra jamesi*) and Black-crowned Tchagras have purplish-brown eyes with a ring of tiny silvery dots surrounding the pupil.

Malaconotid plumage is a little soft to the touch, but lies close against the body. The word *Malaconotus* can be translated as "soft-backed". Aside from the extravagant colours and sharply defined patterns of many of the species, the most notable feature of the family is the feathers of the lower back and rump, which are, in most genera, full, long, soft and fluffy and can be erected or, at least, fluffed out. Several species fluff out the rump feathers in territorial and courtship flight displays, a feature brought to extremes by the puffbacks. Black-backed Puffbacks, for instance, have a striking, bouncy display-flight during which the rump feathers are puffed out into a dense white hemisphere, about the size of a golfball, above the back; alighting in vegetation, males expand the puff ever further, to the extent that it almost envelops the wings. Brubrus have thick rump feathers which are speckled black and white, but they do not fluff them out.

Habitat

In brief, bush-shrikes are birds of woody and leafy vegetation. Being a large family with a good number of moderately diversified genera almost entirely restricted to Africa, the Malaconotidae could be expected to occupy most of the many distinct woody habitats that the continent provides, and that is, in fact, pretty much what they do. Some species live in lowland tropical rainforest, where they skulk in the gloomy understorey and among foliage in undergrowth along the forest's borders or in secondary growth springing up along paths and the edges of windfall gaps, foraging near the ground or, often, on it. They utilize middle and high forest strata, too, and a few species regularly occur in the canopy, where they seldom venture out of the leafiest parts and can be difficult to observe. Malaconotids thrive equally well in wet and mesic montane vegetation, including stands of bamboo and dense woods and scrub with *Hagenia*, *Podocarpus*, juniper (*Juniperus*), olive (*Olea*) and *Philippia* heaths, up to altitudes of 3385 m in Cameroon, 3000 m in East Africa and 2000 m in southern Africa.

Most members of the family are found outside the rainforest zone proper, being inhabitants of the gallery forests that flourish along watercourses and perennial seepages in savannas and in



Both sexes of puffbacks can erect the long, soft, fluffy feathers of the rump to look something like a ball. This is a female ***Black-backed Puffback****, separated from the male by the less intensely black upperparts, creamy rather than snowy white underparts, and greyish rump with shorter feathers than the male's. In the striking, bouncy display-flight, used in defence of territory as well as in courtship, the rump feathers are puffed out into a dense white hemisphere, about the size of a golfball. On alighting, the males expand the puff even further, to the extent that it almost envelops the wings, while the female clicks her bill and occasionally puffs her feathers.*

[*Dryoscopus cubla hamatus*, Kenya. Photo: Dave Richards]



Several kinds of bush-shrike sing in duet, either almost synchronously or antiphonally. One member of a pair answers its mate, perhaps some distance away in the forest. Duetting is best developed in the boubous and gonoleks in the genus Laniarius, *with the responses given after an extremely short time lapse. The male* ***Black-headed Gonolek*** *gives a loud, resonant, bell-like, disyllabic whistle, "hweeu", which the female answers after 0·125–0·160 seconds with a hiss or short, rasping "zeeer", the combined "hweeuzeeer" sounding like the song of a single bird. A pair may often have a number of different duet songs. In Yellow-crowned Gonoleks* (L. barbarus), *it appears that either sex can whistle "hweeu" or rattle "kkkkk" at will, and either can initiate the duet.*

[*Laniarius erythrogaster*, Queen Elizabeth National Park, Uganda. Photo: Ketil Knudsen]

drier savanna woodlands. There they skulk in thick growth, foraging often only a metre or two above the soil; they can still be difficult to see, even though territorial individuals give away their presence by repeatedly calling. Many species are common in open, broadleaf woodlands as typified the southern-tropical miombo (*Brachystegia*), mopane (*Colophospermum*) and gusu (*Baikiaea*) formations, where the birds are often in leafy or thick woody growth such as the thickets growing around termite (Isoptera) mounds. Most tchagras live in even more open situations, in dry wooded savannas with underlying coarse grass and stands or thickets of acacia (*Acacia*) and other thorn bushes. In south-western Africa, the largely terrestrial White-tailed Shrike inhabits leadwood (*Combretum imberbe*), mopane and miombo woods, but also semi-arid savanna scrub on rocky hillsides. Rosy-patched Shrikes are the most desert-adapted of all, living in arid thornbush and hot, sandy coastal plains in north-eastern Africa, where they keep to the densest cover available, such as acacia and aloe (*Aloe*) scrub in lava-fields and dry wadis. Similarly, Red-naped Bush-shrikes in the Horn of Africa inhabit semi-desert thorn-scrub.

At the other extreme, three bush-shrikes are thoroughly water-dependent. The Papyrus Gonolek is confined to the interior of swampy papyrus beds, either in pure stands or in areas of mixed grass–papyrus and a few woody shrubs. The Swamp Boubou is a bird of river floodplains and choked streams, living in dense growth of reeds, papyrus and water figs (*Ficus*), as well as in riverside bushes and gardens; in Cameroon, it inhabits mangrove thickets growing on muddy, tidal shallows. Third, the Marsh Tchagra is commonest in rank growth at the edges of papyrus swamps, marshes and coastal lagoons, although it also occurs in watered sugar-cane (*Saccharum*) and maize (*Zea mays*) fields, tree plantations and abandoned cultivation.

In many regions, two or more congeneric bush-shrike species live sympatrically. In such instances, they generally differ somewhat in the environments which they occupy, although their habitats may also overlap. For example, both the Brown-crowned and Black-crowned Tchagras, regular species throughout Zimbabwe, occur widely there in undifferentiated drier savannas with light thicket cover, obtaining much of their food on the ground. The Black-crowned Tchagra, however, is perceptibly more arboreal and tends to replace its congener in miombo woodland; the Brown-crowned Tchagra predominates in drier situations.

On the whole, bush-shrikes seem to be moderately adaptable, taking to farmland, rural and town gardens, and exotic wattle (*Acacia*), gum (*Eucalyptus*) and coffee plantations wherever there is suitably dense ground cover. It is a tolerance of diverse environments that has enabled the Black-crowned Tchagra to live in a rich variety of natural woodlands and climates, as well as in anthropogenic situations, throughout its huge range in north-western and sub-Saharan Africa and southern Arabia.

General Habits

Bush-shrikes are retiring birds that skulk in undergrowth, on shady ground beneath it and in canopy foliage, and they do not readily show their gorgeous colours, at least to human observers. Tchagras live more in the open and sometimes perch on bushtops or forage on bare soil, where they can be watched for a few minutes, and in leafy suburbs some boubous hop around at the edges of sunny lawns. Except for White-tailed Shrikes, which form small flocks in winter, the members of this family are not gregarious. They live throughout the year in pairs, in territories in forest, woodland, thornveld and large gardens, and they defend the territory from incursion by neighbouring pairs by means of loud singing accompanied by branch-top posturing, which is still largely hidden from human view. Up to 15 Black-backed Puffbacks, mostly juveniles, have been seen together in the treetops, noisily displaying and chasing, but such observations are exceptional.

All malaconotids nest as solitary pairs, the offspring of which disperse away from the parental territory within a few months of fledging. So far as is known, co-operative breeding, with multiple adults tending the nest, is not practised by any member of the family, nor are any bush-shrikes migrants which form visible aggregations when on the move. They are, on the contrary, reluctant fliers. The flights are generally short and low over the ground, and a little heavy, the wings flapping fast until the bird is about to alight, or they consist of flapping followed by a rapid glide.







The territorial song of the ***Rosy-patched Shrike*** *is a whistled duet between two males, or a male and a female. It is initiated with the male's high-pitched "tzee" or "twee-u" or "tzwee-wee" notes, immediately answered by the female with slightly lower "ter-ee" or "tzee-ur" notes, the two then alternating indefinitely. Calling birds duet monotonously for long periods from the top of a bush, perching out in the open, or with only the head visible. Two pairs may duet together, the males only a few centimetres apart. Several functions of duetting have been proposed. The main ones are maintaining long-range contact between mates out of sight of each other in dense undergrowth; promoting mutual mate-guarding; and joint advertising and defence of the lifelong territory of the pair. A study of 18 pairs of Tropical Boubous* (Laniarius aethiopicus) *suggested additional functions. Using playbacks to simulate intrusions into the pairs' territories, the study's authors deduced that duetting serves also as a post-conflict display to advertise social-dominance "victories", in disputes with neighbouring boubous at the territorial interface. Sixteen of the18 pairs stood their ground when confronted with sound recordings of strangers' duets, eleven of them breaking into victory duets as soon as the recordings were switched off. Victory songs are longer and louder than other types of duet, and can be heard across two territories, or throughout an area of the extent of about 25 football pitches. Females responded to recordings of a solo male by beginning to duet, but the male of the pair started to sing in near-synchrony, which the researchers interpreted as trying to jam the signal from an intruding competitor.*

[*Telophorus cruentus hilgerti*, Djibouti. Photos: Roland Seitre]



*The male song of the **White-tailed Shrike** is a mix of a high-pitched, crescendo whistle, and an abrupt liquid "tewp". The female song consists of low-pitched, discordant sounds given at irregular intervals, synchronously with the male's. One 25-second male song consisted of three, one and six whistles alternating with one to ten "tewp" notes, separated by variable-length pauses; the female uttered five "tchzrr" notes, interpolated only with the "tewp" calls. Most or all bush-shrikes also loudly snap or click the bill, or perhaps the tongue, when excited or alarmed; and snap or "frip" the wings in flight, with a noise like a person snapping the middle finger against the thumb, several times in a second.*

[*Lanioturdus torquatus*, Namibia.
Photo: Michael Gore]

Fifty years ago, V. G. L. van Someren, in his book *Days with Birds*, gave descriptive accounts of several Kenyan malaconotid species, and these serve well to give a rounded impression of the general deportment of the family. Writing of the "Pied Bush Shrike", now known as the Tropical Boubou, he stated that "These birds hunt for food by creeping and hopping about among heavy tangled bush, often searching the ground for insects that lurk in leaf debris and moss. When on the ground they stand with legs at full length, tail slightly raised above the wing tips, and body feathers drawn close. They may turn a leaf or a bit of bark if they have seen an insect disappear under it. They just hop, disturbing the insects as they move [and] may sometimes come out of the bush and hunt in the side drains of a road or the silt along a path after heavy rain. They are secretive and skulking; if one does see them momentarily in the open, they immediately take cover."

Perhaps it is not surprising that so little appears to have been observed of such habits as comfort behaviour, preening, scratching, water-bathing and dust-bathing, pellet regurgitation and roosting. A few species have been seen to drink. Most of their diet of insects and small vertebrates is obtained by searching, creeping through undergrowth or hopping over the ground and snatching any suitable animal encountered. Bush-shrikes



Tchagras are middle-sized bush-shrikes, only one-third to half the weight of Malaconotus *species, but with a fairly heavy bill, and they take much the same range of prey as the larger birds. The **Black-crowned Tchagra**, because it is an open-country bird with a vast range, is one of the best-known bush-shrikes. It captures most of its prey on the ground, or in low bushes, where it creeps about while gleaning stems and lower branches for insects. Hops about under dense growth around the bases of trees and bushes, flicking aside debris, pulling apart dung, scratching at soil, and making small jumps to snatch insects from overhead leaves. Prey is mostly insects, but also spiders, snails and reptiles.*

[*Tchagra senegalus kalahari*,
Okavango Delta,
Botswana.
Photo: Nick Garbutt]



Bush-shrikes in the genus Laniarius *are mostly larger than tchagras, and take quite large prey, including beetles, caterpillars, large numbers of grasshoppers and locusts, and occasionally small birds and nestlings.* ***Yellow-crowned Gonoleks*** *forage singly and in pairs, low down in woody growth. If undisturbed, they spend much of their time on the ground, assuming a rather upright posture. They hop or creep among branches and on the ground, flicking aside dry leaves and woody litter, and making short runs after insects. They fly reluctantly. They also forage in the canopy up to 5 m high. Partners usually forage within a few metres of each other, and call frequently, whether in sight of each other or not.*

[*Laniarius barbarus barbarus*, Western Division, Gambia. Photo: Dick Forsman]

will also make short fluttering flights through foliage or the air in pursuit of an insect, and they have been seen, infrequently, to chase a small bird, seldom catching it, but they are never sit-and-wait or full-chase predators in the manner in which laniid shrikes are. To their own kind they can be aggressive: the chasing of rivals out of the territory or the chasing away of a third party during courtship is frequent, and to some extent other bird species are chased out of the territory also. Contrarily, bush-shrikes often join mixed-species foraging flocks of mainly insectivorous birds, although it is not yet clear whether the ones concerned are territory-holders or, likely enough, unestablished juveniles; nor is there any information on the ways in which they interact with their fellow travellers.

Voice

The various genera of Malaconotidae all have loud and distinctive songs and a varied vocabulary of calls. The same songs seem always to function both in courtship and in territorial proclamation and defence; countersinging across territory boundaries is common. In addition to producing vocalizations, most or all spe-



The ***White-tailed Shrike*** *is both terrestrial and arboreal, foraging in low, dense vegetation and on the ground beneath, and also commonly in trees at all levels up to the canopy. On the ground it moves restlessly in long hops, seizing prey from the soil surface, or jumping up to take insects from the tips of grass stems. In trees, it gleans insects from trunks, branches and foliage, sometimes hanging momentarily upside-down, occasionally darting out to catch insects in flight. Prey includes beetles, moths and butterflies, caterpillars, mantids and grasshoppers. Mostly seen singly and in pairs, in winter it is also found in flocks of up to twelve birds, and joins mixed-species foraging flocks.*

[*Lanioturdus torquatus*, Erongo Mountains, Namibia. Photo: Dick Forsman]



*The **Southern Tchagra** forages low down in dense scrub, or on the ground, where it runs and hops, flicking over debris in the manner of a* Turdus *thrush. Prey includes beetles, corn crickets, larvae, small molluscs, and berries. There are reports of the similarly-sized Black-crowned Tchagra* (Tchagra senegalus) *holding down grasshoppers with its foot and dismembering them, wedging a snake between roots and tearing it apart, and disembowelling a mouse, pulping it and feeding it to nestlings.*

[*Tchagra tchagra caffrariae*, Addo, South Africa. Photo: Geoff McIlleron]

cies loudly snap or click the bill—or is it, in fact, tongue-clicking?—often when excited or alarmed; they also snap or, as it is usually called, "frip" the wings in flight, each wingbeat making a noise rather like that made by a person snapping the middle finger against the thumb, several times in less than a second.

Several kinds of bush-shrike sing in duet, either almost synchronously or antiphonally, one member of a pair answering its mate, perhaps some distance away in forest, after what is often an extraordinarily short time lapse. This has stimulated practical experimentation and a good deal of playback analysis, both in the aviary and in the field, as well as a considerable body of theoretical speculation on the communicative functions involved. Bush-shrike duets are undoubtedly among the most remarkable of African bird vocalizations; the various voices of each species have been described in great detail, and summarized genus by genus at much greater length than can be repeated here, by Harris and Franklin in their comprehensive work *Shrikes and Bush-shrikes*.

Members of the genus *Malaconotus* do not duet, but they deliver, from the depths of thick forest or woods, loud and far-carrying whistles, generally in a series of 4–10 notes, "hoh" or "whooooooo" by different species, the series repeated after a pause of a few seconds. The whistles have a strange quality, described variously as haunting, spooky, hollow, resonant, mournful, quavering, short or drawn out, although mostly of 0·5–0·7 seconds' duration, penetrating, and sometimes falsetto at the end. Uluguru Bush-shrikes have a low-pitched but strident and far-carrying two-syllable "huw-teew", the second note a little higher than the first; the song is quite recognizable generically.

Male tchagras have a cheery, jaunty song of 5–10 whistles in the case of some species, 10–30 in that of others, the whistles usually progressively longer and descending the scale, and commonly preceded by wing-fripping. The whole lasts for up to six seconds, and sometimes more. Female Southern Tchagras (*Tchagra tchagra*) have the same song as the males, and it is sung nearly in unison with the partner's song. Male Black-crowned Tchagras deliver a series of mellow, lilting, warbling whistles, sweet and deliberate, and descending the scale; the female sings, often in duet with the male, with a hard, rattling, descending trill. Marsh Tchagras have a shorter, cheery song, those of the male and the female quite alike and given often in duet; there is considerable regional variation, which is partly the basis on which some southern African taxonomists split this into two distinct species.

Differing from those of the preceding genera, and varying much among species, the songs of the puffbacks often incorporate a tearing "zzztz" component. They are given commonly in flight and with much wing-fripping and bill-clicking. The territorial song of the Red-eyed Puffback is a rolling snore of two seconds' duration, "tzzzzrrrreeeeawrrrrr". Sabine's Puffback has a descending series of 5–15 or, often, many more notes and lasting for up to two minutes; it starts with thin, squeaky and high-pitched notes like the sound made by a bicycle pump, and develops into longer, louder, ringing notes, the male and the female singing almost synchronously. In contrast, male Black-backed Puffbacks utter a percussive click followed by a loud, clear whistle repeated about ten times in ten seconds, the female often responding instantly with a tearing scold; alternatively, the female can initiate the sequence and the male respond in duet.

The six *Chlorophoneus* species have generically similar songs, commonly given in almost synchronous duet. The males deliver repeated ringing whistles, the females emitting harsh dry snarls like those of female puffbacks. In *Telophorus*, Gorgeous Bush-shrike males sing repeated short-phrase whistles, and females of one subspecies, but perhaps not those of the other, respond in duet with harsh rasps. Bokmakieries give very varied songs, consisting of loud whistles by both sexes in near-synchronous duet. This species' English vernacular name is onomatopoeic; it is derived from the "bok-mak…" vocalization made by one sex followed immediately by a trilling "rie-rie-rie…" by the other. The songs of the other two *Telophorus* species are not well known.

Turning to the two monotypic genera, the male Brubru makes a far-carrying, regionally variable trill, resembling the sound of a pea-whistle or a telephone, and the female has a variety of soft notes and squeaks, sometimes given in synchronous or antiphonal duet; the English name of this species, too, is onomatopoeic, reflecting the male's trilled call. White-tailed Shrikes have a diversified and ill-researched vocabulary of whistles, churrs, explosive and ratchet-like notes and songs, the sexes often vocalizing in antiphonal duet.

Duetting is developed best in the boubous and gonoleks in the genus *Laniarius*. The vocalizations of this genus of bush-shrikes are consequently the ones which have been the most thoroughly studied of all malaconotid vocalizations. As Harris and Franklin describe it, the basic structure of the song consists of repeated low-pitched ringing, monosyllabic or disyllabic whistles, along with harsh, croaking, tearing, ratchet-like clicking and





Bush-shrike foraging methods are quite different to those of the "true" shrikes (Laniidae). None of them are sit-and-wait predators, scanning the ground from a perch. Although they have been seen chasing small birds in flight, they rarely catch them, and certainly do not hunt them down in the relentless manner of the laniid shrikes. Among the foliage, the smaller bush-shrikes creep and glean like the Sylvia *warblers that some of them resemble. On the ground, the foraging methods of several genera of bush-shrike are similar to those of* Turdus *thrushes. But rather than tossing leaf litter aside in a thrush-like manner, in the hope of revealing prey, the boubous and gonoleks turn over particular leaves or bits of bark, as if they have seen prey moving or disappearing underneath. Although like most bush-shrikes,* ***Southern Boubous*** *are usually secretive and keep mainly to the shelter of dense vegetation, they will also emerge to feed in gardens. They will even visit bird tables, where they are known to eat grain and porridge. Their usual diet is of insects such as beetles and grasshoppers, snails, small birds, nestlings and eggs, and house mice. They have been seen pulling bark off dead trees, in search or pursuit of geckos. They can deal with prey that other species might find unpalatable or too dangerous to eat. Hairy caterpillars are rubbed vigorously against branches or in sand before being swallowed. The stings of bees are similarly rubbed off against a perch. To eat a snail, the Southern Boubou breaks open the shell by repeatedly beating it against a branch, or wedges it into a crevice, and tugs the flesh out with its bill. This bird is eating the seeds of the South African endemic* Strelitzia.

[*Laniarius ferrugineus ferrugineus*, Cape Town, South Africa. Photos: Peter Ryan]



*A large bush-shrike with a robust, strongly hooked bill, the **Grey-headed Bush-shrike** can tackle bigger prey, including large insects, rodents, bats, frogs, geckos and other lizards, and snakes up to 60–70 cm long. Prey such as geckos may be beaten to death against a branch, before being wedged between twigs, torn apart and eaten piecemeal. A bird may return frequently to a favoured place for killing, wedging and dismembering prey. It often raids birds' nests, and may attempt to catch a small bird by pursuing it through vegetation. It forages at all levels, working its way up a tree to the canopy, appearing to pay more attention to branches than leaves.*

[*Malaconotus blanchoti hypopyrrhus*,
Letaba,
Kruger National Park,
South Africa.
Photo: Geoff McIlleron]

nasal twanging sounds, delivered by the male and the female in well-developed duets, a pair of individuals often having a number of different duet songs. In the case of, in particular, the Crimson-breasted Shrike and the three crimson-bellied gonoleks, the time between the start of one individual's song and its mate's response is incredibly short, so that the combined song has something of a whiplash quality, and, especially when male and female are close to each other, it sounds exactly like one single quick-fire song. A pair of Yellow-crowned Gonoleks, for instance, has a precisely synchronized duet in which the motif of the initiating partner, a loud, pure liquid whistle 0·2–0·3 seconds long, is answered by its mate after one-tenth of a second, or fractionally less, with a rasping trill also 0·2–0·3 seconds long, so that the whole duet is delivered in 0·3–0·4 seconds. It appears that either sex can whistle "hweeu" or rattle "kkkkk" at will, and also that either one of them can initiate the duet, which can therefore sound like "hweeu/kkkkk" or "kkkkk/hweeu" or even a tripartite "hweeu/kkkkk/hweeu", in each case the "hweeu" and "kkkkk" being largely synchronous.

The biological functions of these extraordinary duets have been investigated by W. H. Thorpe, W. Wickler, U. Seibt, E. Sonnenschein, H. U. Reyer and others, focusing on Slate-



*The laniid shrikes store their prey by impaling it on thorns or barbed wire. One of the distinguishing characteristics of bush-shrike behaviour is that they do not normally do this. Yet there are a few records, particularly of captive **Southern Boubous** and Tropical Boubous* (Laniarius aethiopicus), *apparently storing surplus food in "larders" in this way. Although one captive Southern Boubou was described as regularly impaling prey, it is possible that the food had become wedged on a spiny protuberance as the bird secured it in order to tear it apart. This kind of accident could be the evolutionary origin of deliberately impaling and storing food for later.*

[*Laniarius ferrugineus ferrugineus*,
Nature's Valley,
Western Cape, South Africa.
Photo: Will Nichol]

coloured Boubous. This species sings in antiphonal, rather than synchronous, duet, the males usually with gong-like notes and the females with fluty whistles. A gong-and-whistle duet, lasting only 0·7 seconds, is generally initiated by the male, but an individual of either sex can sing its mate's phrases, and a female can initiate a duet with its own or its mate's notes. The boubous learn "male" and "female" components from a same-sex tutor in their first few months; once learnt, individual repertoires do not change, and a mated pair combines its notes into a set of pair-specific duets which remain constant for life. The pair uses several standardized call–answer sequences, and switches between them; the two partners can deliver a thousand duets in a day, the total duetting time amounting to 1–1·5 hours daily. Pair duets and repertoires vary regionally, local dialects being passed from one generation to the next by social learning. Besides reacting vocally to its mate, a Slate-coloured Boubou reacts to same-sex rivals that it sees or hears by countersinging with them, and it will occasionally duet with other species, including Tropical Boubous and Black-headed Gonoleks. Several functions of duetting have been proposed. The main ones are that of maintaining long-range contact between mates out of sight of each other in dense undergrowth, that of promoting mutual mate-guarding, and that of joint advertising and defence of the lifelong territory of the pair. The strengthening of the pair-bond and the ensuring of breeding synchrony also have been suggested as possible functions.

Earlier studies of the duetting behaviour of the Southern Boubou and Tropical Boubou species pair led to much the same conclusions about functions as have been reached with regard to Slate-coloured Boubous. They have recently been supplemented by the investigations of Tropical Boubous undertaken by T. U. Grafe, J. H. Bitz and colleagues, who have proposed fascinating additional functions. These authors' novel deduction, arising from voice-playback study of simulated intrusions into 18 Tropical Boubou pair territories in Comoé National Park, in Ivory Coast, is that duetting serves also as a post-conflict display to advertise social-dominance "victories" in disputes with neighbouring boubous encountered near the territorial interface. Sixteen of the 18 pairs stood their ground when confronted with sound recordings of strangers' duets, eleven of them breaking into victory duets as soon as the recordings were switched off. Victory songs are longer and louder than other types of duet and can be heard across two territories, or throughout an area of the extent of some twenty-five football pitches. In nature, victory duets are sung probably to deter strangers or neighbours from entering a pair's territory. Grafe and Bitz also played tape-recorded male solo voices to territorial pairs. Females responded, creating duets, and with three of the six pairs studied the male started to sing in near-synchrony with the "foreign" male recordings, an action which the researchers interpreted as the jamming by males of the signal from an intruding male competitor.

These studies are providing new insights into the complexities of vocal communication by tropical birds living in dense habitats. Among bush-shrikes, interspecific differences in duet structure and duetting behaviour are likely to have been shaped adaptively by the conflicting sociosexual demands of competition and co-operation. It is an exciting and fast-developing field of research, and there is every reason to believe that in the case of *Laniarius* and other bush-shrike genera, as well as the many other duetting genera such as *Thryothorus* wrens and *Hypocnemis* antbirds, researchers to date have been merely scratching the surface.

Food and Feeding

The secretive nature of bush-shrikes, skulking in thick cover often high up in trees, makes them difficult birds to study, and as a result there have been no systematic field investigations into their feeding behaviour. Indeed, there are only a few protracted series of observations at the nest of food items brought to chicks. Much of what is known is the result of opportunistic, transient observations.

Among the six species of *Malaconotus*, almost nothing is known about the Green-breasted, Monteiro's and Uluguru Bush-shrikes, the problem of learning about the feeding habits of these species being compounded by their rarity and apparent canopy-foraging habits. So far as is known, they all search for food by moving rather cautiously, hopping along or between mainly small branches and tangles of creepers in forest undergrowth, middle strata and high canopy; sometimes they come to the ground. Fiery-breasted Bush-shrikes often remain motionless for several minutes, and it is tempting to suppose that they are then waiting patiently for a cryptic prey animal to reveal itself by movement. In all events, these large shrikes are predatory, taking quite large insects such as beetles (Coleoptera), tree locusts (*Anacridium*), cicadas (Cicadidae), butterflies and caterpillars (Lepidoptera), and small vertebrates such as tree-frogs (Rhacophoridae). The bush-shrike holds down its prey under one foot and uses its bill to tear



All malaconotids are thought to be monogamous breeders, in single pairs with lifelong bonds, maintaining the same large, all-purpose territories throughout their lives. A pair of ***Bokmakieries*** *will defend and advertise the territory throughout the year. They perch on a low eminence with body inclined, and neck upstretched so that the yellow throat is displayed, and sing solos or duets. Bush-shrike courtship displays are much the same as territorial threat displays and the singing can change into a more threatening or sexually charged display, with bowing, jerky side-to-side movements, wing-flicking and tail-fanning.*

[*Telophorus zeylonus zeylonus*, Bontebok National Park, South Africa. Photo: Rolf Kunz]

it apart, consuming the food piecemeal. Lagden's Bush-shrike preys on lizards of the genus *Agama* and on small birds, as well as on insects, and it beats a large item vigorously against the perch in order to immobilize it. Rather more is known about the Grey-headed Bush-shrike, as this is a bird of savanna woodland, living in more open, less lofty trees than its forest congeners. It also forages among dense foliage and twiggy growth at all levels up to the canopy, seeming to glean items from wood, rather than from leaves, and clambering or creeping along slowly, twisting the head and peering about, even beneath branches, as if making a thorough search for animal prey. It often glides down to the base of a tree and takes its time in working its way up to the canopy, repeating the process in an adjacent tree. On finding prey, the shrike makes a lunge at it, grabbing it with the bill; it holds down a small item under the foot or wedges a large one into a fork, and then dismembers the prey. Occasionally, the Grey-headed Bush-shrike makes a short flight to capture a flying insect, with an audible snap of the bill as it seizes its victim. On the ground it pursues a fleeing animal in long leaps. This species is known to take a wide variety of prey, ranging from mason wasps (Vespidae) and other Hymenoptera, grasshoppers (Acrididae), scorpions (Scorpiones) and centipedes (Chilopoda) to small birds and their eggs and nestlings, small rodents, frogs, chameleons (Chamaeleonidae), skinks (Scincidae), snakes and even bats (Chiroptera).

Tchagras are middle-sized bush-shrikes, only one-third to one-half of the weight of *Malaconotus* species, but they have a fairly heavy bill and they take the same range of prey as the larger birds and catch it in much the same manner, except that the tchagras are more terrestrial. The Black-crowned Tchagra, because it is an open-country bird with a vast range in the Maghreb, sub-Saharan Africa and southern Arabia, is one of the best-known bush-shrikes. Reviewing the literature, B. Hillcoat reported on its diet in the Maghreb, and Harris and Franklin on that in the rest of the continent. This bush-shrike eats mainly grasshoppers up to 6 cm in length, beetles of many kinds, larvae and small lizards; in addition, it takes crickets (Tettigoniidae), cockroaches (Blattodea), mantises (Mantidae) and mantis egg cases, nymphs, cicadas and other bugs (Heteroptera), termites, wasps, moths and caterpillars, spiders (Araneae) and occasionally tadpoles, tree-frogs and small snakes, with single records of an earthworm (Oligochaeta), a mouse (Muridae) and small fruits. It captures most of its prey on the ground or in low bushes. When on the ground, Black-crowned Tchagras hop about under dense, shady growth around the bases of trees and bushes, flicking aside debris rather in the manner of a Eurasian Blackbird (*Turdus merula*), pulling apart dung, scratching at the soil, and making small upward jumps to snatch an insect from an overhead leaf. They can run quite swiftly, perhaps more to cross an open space than to chase prey. They clamber up into bushes, where they creep about while gleaning stems and lower branches for insects. Occasionally they fly out in brief aerial pursuit of a flushed insect, and sometimes they join mixed-species flocks foraging in trees. They have been known to attack small birds, but not to kill any. There are reports of Black-crowned Tchagras holding down and dismembering grasshoppers, wedging a snake between roots and tearing it apart, and disembowelling a mouse, pulping it and feeding it to nestlings. Van Someren reported that nestlings of this species in Kenya are fed with moth larvae, acridid nymphs, beetles and spiders, and that, if there happens to be a temporary water pool where frogs are breeding, tadpoles also are taken. It would be interesting to know exactly how the last-mentioned are caught. The little that is known about other tchagra species suggests that their diets and foraging behaviour are much the same as those of the Black-crowned Tchagra, although Marsh Tchagras regularly search the stems of reeds and grasses, as well as gleaning in bushes; their prey spectrum includes dragonflies (Odonata). Van Someren observed several pairs of Brown-crowned Tchagras closely at their nests; one individual was seen to hold a grasshopper nymph under one foot and use its bill to pull off the victim's legs, and then to pulp the insect's body by passing it to and fro across the bill, before feeding it to a chick.

Gonoleks, boubous and bush-shrikes in the genus *Laniarius* are mostly somewhat larger and heavier than tchagras, but still only half the weight of *Malaconotus* species; commensurate with their size, they take quite large prey. Their diets and their ways of



All bush-shrike nests are bowl-shaped or cup-shaped structures, rather loosely built, and placed in bushes or trees. In some species the female does all the work, although the male may escort her. ***Crimson-breasted Shrike*** *nests are built by both sexes, usually around 3 m up in a fork of an acacia tree. They are made largely of shreds of fibrous bark from acacia trees, which are added to the nest by each bird in turn. The base of the nest is secured with spiders' web. Work takes around five days, and the result is a rather untidy and bulky, poorly bound open cup, lined with rootlets, dry weed stalks and strips of maize leaf. In one study, around half the nests were "inexplicably" destroyed by their makers, before or after eggs were laid. Other species are thought to destroy and recycle the materials of failed nests.*

[*Laniarius atrococcineus*, Mahango Game Reserve, Namibia.
Photo: Andy & Gill Swash/ WorldWildlifeImages.com]



*The nest of the **Orange-breasted Bush-shrike** is built by both sexes, usually near the site of the previous season's nest. It is placed between 4 m and 10 m up, in a multiple fork (or as here, wedged between numerous twigs), in the lateral branches of a thorn tree, or among thick foliage or creeper tangles. Made from grass, petioles and fine twigs, it is so flimsy and openly constructed that, despite the lining of fine rootlets and creeper tendrils, the eggs are visible from below. Most bush-shrikes are single-brooded and appear to be so throughout their ranges. Bush-shrike breeding seasons are long, and eggs and young have been found in nearly all months, with peaks at times of greatest prey availability.*

[*Chlorophoneus sulfureopectus similis*, Modimolle, Limpopo, South Africa. Photo: Warwick Tarboton]

searching for and catching prey are again similar to those of *Malaconotus*. They hop about on the ground under dense vegetation and creep through twiggy growth, thickets and tangles of lianas, moving rather slowly, searching methodically, and seizing prey as they encounter it. Several species have been observed to join mixed foraging parties of insectivorous birds as these work their way through trees in the bush-shrike's territory; in such circumstances, the malaconotids concerned glean food from trunks, branches and foliage, peer under flakes of bark, and occasionally hawk an insect on the wing. On the ground, rather than flicking debris aside in thrush-like manner, they turn over a leaf or a bit of bark as if they have just seen an insect disappear under it. Ground prey taken by *Laniarius* species include a variety of arthropods and other small animals, among them isopod crustaceans, ticks (Ixodoidea), spiders, millipedes (Diplopoda), small snails (Gastropoda) and worms. In studies of forest birds that attend swarms of carnivorous ants for flushed prey, E. O. Willis noted that Fülleborn's Boubous in Tanzania regularly follow carnivorous *Dorylus* ants in the West Usambara Mountains, hopping as low as 30 cm above the soil through weeds and tangles and making short sallies to the ground, and moving up into vine tangles to peck at stems; he found that Mountain Boubous did the same in Nyungwe Forest, in Rwanda. Tropical Boubous eat swarming *Dorylus* ants, and they and several others sometimes take small berries and nuts. Vertebrate prey include tree-frogs, geckos (Gekkonidae), skinks, eggs of reptiles and birds, nestlings of small birds, and mice; Tropical Boubous, and probably other species as well, are persistent plunderers of bird nests. Vertebrates, snails and larger arthropods are generally held down under one foot, or wedged into a tree fork, torn apart and eaten piece by piece. Van Someren observed that two-day-old nestlings were fed with grasshoppers, mantids and moth larvae, and that, at seven days, the chicks were given mantids, long-horned grasshoppers, saturnid moths, noctuid caterpillars, several tree-frogs and skinks, nestling Common Waxbills (*Estrilda astrild*) and a 30-cm tree-snake. One end of the snake was put into the mouth of one nestling and the other end was placed in the mouth of another chick, a situation which, had it not been for the ultimate intervention of the observer, might have killed the nestlings.

As noted by S. J. Tyler and L. Tyler in Botswana, Crimson-breasted Shrikes frequently associate with parties of Southern Pied Babblers (*Turdoides bicolor*) and those of the less common Arrow-marked Babbler (*Turdoides jardineii*), hopping around after them on the ground and snatching any insects that they disturb. Others constantly attended a Common Scimitarbill (*Rhinopomastus cyanomelas*) as it probed bark for food, and one once attended upon a Hoopoe (*Upupa epops*), following it as it foraged on an earth bank and repeatedly darting forward to try to catch dislodged insects. Crimson-breasted Shrikes are also on record as breaking up and eating, piecemeal, birdtable peanuts.

Puffbacks, because they forage largely in the canopy, are less well known than are boubous. Sabine's Puffback seldom comes below 8 m above the ground, and for much of the time it remains above 20 m and up to the tops of 45-m-tall trees, where it searches twigs, vine tangles, outer branches and clusters of foliage, picking prey off both the upperside and the undersurface of leaves. Puffbacks often join mixed flocks of insectivorous birds, sometimes hawk insects in the air in flycatcher fashion, and rarely come to the ground except to retrieve a dropped morsel. They thrive mainly on the same range of insects as is taken by other bush-shrikes, and they are known occasionally to eat spiders, small frogs, lizards, birds and bird eggs. Buds have been found in the diets of two puffback species.

Chlorophoneus bush-shrikes feed in a manner similar to that of the puffbacks, by creeping and hopping along mossy branches in the canopy while in a crouched posture, searching twigs, leaves and trunks. They may be incipient Hymenoptera specialists, since bees, wasps and ants have been found in the diets of three of the six species. The Mount Kupe Bush-shrike differs from its *Chlorophoneus* congeners in several ways, and has been seen to hang sideways on a vertical stem, springing up vertically to snatch an insect and falling back to the perch in a twisting way; its prey includes beetles, grasshoppers and caterpillars, large items being beaten against the branch before being consumed.



*The nests of the **Brubru** can be highly cryptic, being profusely covered with foliaceous lichen so that they blend with the lichen-encrusted branches they are built on. The nests are slight, and built from delicate materials. Two were found to consist of only three materials: spiders' web, around 95 pieces of lichen, and up to 550 fine, pliant leaf petioles. Brubrus have a strong tendency to abandon early nests without laying in them; one pair built and destroyed three nests in four weeks, eventually laying in a fourth nest which they began towards the end of that time. Brubru clutches are of two to four eggs, generally two; bush-shrike clutches in general are typically of two or three eggs. Complete clutches of one or four are rare.*

[*Nilaus afer solivagus*, Marondera, Zimbabwe. Photo: Peter J. Ginn]

The Gorgeous and Doherty's Bush-shrikes, small birds of dense undergrowth, glean insects from stems, branches and leaves. They often forage on the ground, by turning over leaves and debris. The two large *Telophorus* shrikes feed far more on the ground than in the foliage of bushes. The Rosy-patched Shrike runs about hurriedly on bare soil or through grass close to cover, and so, too, does the much better-known Bokmakierie, moving often in zigzags. The latter species, on catching a small insect, eats it immediately, but larger items such as hairy caterpillars it first wipes or beats against the ground and then carries in the bill to a concealed place, where it swallows the food. Bokmakieries search shady bases of clumps of grass, bush stems and tree trunks, jump up to take an insect just out of reach, and in bushes gradually work their way upwards, gleaning branches and foliage, perhaps flying out to hawk a passing moth, and gliding down to the base of another clump of bushes.

The two monotypic genera differ from each other in several respects. The White-tailed Shrike is a shy but inquisitive species which forages actively in low, dense vegetation and on the ground beneath it, as well as feeding commonly at all heights in trees. It gleans insects from trunks, branches and foliage, sometimes hanging momentarily upside-down, and occasionally flying out to seize an insect in flight. When on the ground, it moves restlessly, in long bounds, with the short tail held pointing straight downwards, and snatches prey from the soil surface or jumps upwards to take insects from the tips of grass stems. The White-tailed Shrike joins mixed-species foraging parties; in the non-breeding season flocks in Angola have been seen to forage on the ground often with White-headed Black-chats (*Pentholaea arnotti*), Sharp-tailed Starlings (*Lamprotornis acuticaudus*) and White-winged Babbling Starlings (*Neocichla gutturalis*). Lastly, the Brubru differs from other members of the family in being strictly arboreal and never coming to the ground. It is an active bird, constantly on the move, searching for small insects and spiders in foliage and for terminal fruits in the middle and upper strata of large woodland trees. It will sometimes hang upside-down to probe a pod, and it will occasionally hawk a flying insect. It holds larger morsels under one foot and tears them apart.

One of the characters that distinguishes malaconotid bush-shrikes from the "true" shrikes of the genus *Lanius* is that the former hardly ever impale prey on a thorn or wire barb for later consumption. Grey-headed Bush-shrikes have been said to cache food items, and a Yellow-crowned Gonolek in Nigeria was claimed once to have killed a Red-cheeked Cordon-bleu (*Uraeginthus bengalus*) and impaled it upon a thorn, but the account was second-hand and it remains in need of substantiation. Nevertheless, in captivity, Southern Boubous and Tropical Boubous have been known to impale prey, although it is not certain whether this was for storage, to be eaten later, or merely an accidental result of wedging the item in a spiny cleft as a means of securing it in order to tear it apart. Sonnenschein and Reyer reported that a captive Tropical Boubou also stuck pieces of ox heart on to branches in its aviary. The behaviour will doubtless be much easier to observe if practised by captive birds than it would be if carried out by wild individuals. In any event, cleft-wedging and the accidental impaling of prey on a splinter for the purposes of immediate dismembering may well be the evolutionary origin of deliberate impaling and caching for later consumption, a habit of considerable interest.

Breeding

At least as secretive in nesting as in all other aspects of their lives, bush-shrikes are for the most part ill known in that regard. Basic information about the breeding biology of several species was obtained decades ago by a handful of dedicated amateurs such as W. Serle, in West Africa, van Someren, in East Africa, and A. W. Vincent, in south-eastern Africa, all of whom patiently made observations from sweltering hides with little more at their disposal in terms of resources than binoculars and a notebook. In more recent times, benchmark studies have been made by W. R. Tarboton, who watched breeding Crimson-breasted Shrikes and Brubrus in South Africa, and by Sonnenschein and Reyer, who observed Slate-coloured Boubous in Kenya, but much remains to be learnt even about those species. Nothing at all is known about the breeding biology of Lagden's, Green-breasted, Monteiro's and Doherty's Bush-shrikes, Mountain and Somali Boubous and Papyrus Gonoleks, except the little that can be inferred about seasons, and the nesting habits of some 26 further species of bush-shrike are still poorly known. That said, it is thought that all members of the family are monogamous, breeding





For some bush-shrikes, incubation begins with the first egg laid, but most start to incubate only when the clutch is complete. Incubation in the ***Gorgeous Bush-shrike*** *is carried out mainly by the female. Similarly, in the puffbacks* (Dryoscopus)*, the Grey-headed Bush-shrike* (Malaconotus blanchoti)*, the Black-crowned Tchagra* (Tchagra senegalus) *and the White-tailed Shrike* (Lanioturdus torquatus)*, incubation is undertaken solely or mainly by the female. With all other bush-shrikes, so far as is known, the male and the female take practically equal shares in the tasks of incubating the eggs, brooding the young and feeding the nestlings and fledglings. The Gorgeous Bush-shrike's nest is a rather thin untidy platform or saucer of twigs, roots, stalks and grasses, lined with dry leaf petioles and tendrils, built relatively low down in the undergrowth. There is no information on the duration of incubation in this species or in most other bush-shrikes. Brubrus* (Nilaus afer) *incubate for around 19 days, with stints of 17–178 minutes, averaging 42 minutes. When the female Brubru is sitting, the male initiates the change-over by calling as he approaches, and she responds in duet. When the male is sitting, he initiates the change-over by calling from the nest, and the female takes over immediately. The female sits more than the male during the day, and does so exclusively at night. In the White-tailed Shrike, incubation is by the female alone. She is fed on and off the nest by the male. He utters a trilling call as he arrives on a nearby tree, and she immediately leaves the nest and joins him. Sometimes soliciting with quivering wings, she takes the offered food, hops about with him for a few minutes, then returns to the nest tree cautiously and indirectly, and resumes sitting.*

[*Telophorus viridis quadricolor*, KwaZulu-Natal, South Africa.

Upper photo: Guy Upfold. Lower photo: Hugh Chittenden]



This picture shows an apparently immature ***Gorgeous Bush-shrike*** *incubating. The photographer explains: "The mate was an adult in striking plumage—we presumed that the immature was the female, and the adult was the male, as the former did all the incubating. Periodically the 'male' would call from about five metres away, and the sitting bird would slip off the nest to fetch food." The adult did not come to the nest in the two days the photographer was present. Although the eggs hatched, the young probably did not fledge, since the birds were gone twelve days later, and the nestling period in the Gorgeous Bush-shrike is 19–21 days. When sub-adults breed, it may be because of a shortage of adults in the population.*

[*Telophorus viridis quartus*,
Bvumba, Zimbabwe.
Photo: Peter J. Ginn]

in single pairs with lifelong bonds, resident for most of their lives in quite large all-purpose territories which they defend vigorously by singing. There is no incontrovertible evidence of co-operative breeding by any of the species. This is, however, so widespread a phenomenon among the generality of birds in hot climates and relatively aseasonal habitats that it would not be unexpected, even though bush-shrikes are so rarely seen in groups of three or more individuals, whereas year-round flocking is commonplace among co-operatively breeding species. Additional, third individuals have been seen at the nests of pairs of Crimson-breasted Shrikes, but they have not been observed to help in any way with the rearing of the young.

Most species are single-brooded and appear to be so throughout their ranges, but in southern Africa good numbers of Tropical Boubous, Southern Tchagras, Bokmakieries and Orange-breasted Bush-shrikes are double-brooded. In any event, breeding seasons are protracted. In West Africa, most of the better-known malaconotids breed from about December to June, a period covering the dry season and the first few weeks of the following rainy season, but eggs or nestlings have been found in nearly all months. In southern Africa, breeding seasons are nearly all from about September to April, with egg-laying peaks in the vernal months of September to December. In East Africa, parts of which have "long rains" in March to June and a second "short rains" season in about August to November, bush-shrike populations breed in one or both of the wettest periods; in Uganda, Black-headed Gonolek clutches have been found in nearly all months, but mainly in April–June. It is much the same with Tropical Boubous in Kenya, where Black-headed Tchagras nest in both rains, mainly in April and November–December. Whether the same pairs of birds breed twice each year, once in each rainy season, is open to question. Presumably, breeding is timed so that the rearing of the young coincides with periods of greatest availability of food, especially insects.

Territories of malaconotids are large, and pairs are widely spaced. Density varies according to vegetation type, a solitary pair occupying seldom less than 3 hectares, often about 10–20 ha, and in the case of large and not very common birds, such as Grey-headed Bush-shrikes, up to 200 ha. Within their territory the male and the female often appear to forage some distance apart, so that in dense woody and leafy growth they may be unable to see each other; they do, however, keep in contact vocally, it seems, with frequent calling and near-synchronous duetting. Duetting increases in frequency during the breeding season, and it functions in rebuffing neighbouring pairs' attempts to transgress territorial boundaries, in advertising the territory-owners' victories in such encounters, and even in jamming the voice of an intruding rival. In this family, territorial advertisement and courtship behaviour are sometimes inseparable.

There is a broad measure of agreement that a principal purpose of duetting is that of maintaining the pair-bond, and it is only to be expected that duetting frequency increases as breeding gets underway. Two Bokmakieries, presumed male territorial rivals or the male and female of a pair, will perch conspicuously on top of a rock, bush or small tree and countersing or duet with loud, ringing calls. They adopt an upright, inclined stance, with the neck stretched and the bill pointing upwards, making the yellow throat and black pectoral band especially obvious as they call, and at the same time the yellow-tipped black tail is fanned; this can change into a threatening or sexually charged display with bowing, tense and jerky side-to-side movements of the body, wing-flicking and repeated tail-fanning, which can be followed by short flights with snapping, or fripping (see Voice), wing noises. Elements of this behaviour are exaggerated in the displays of other bush-shrikes. Van Someren observed territorial and breeding behaviour probably as closely as anyone else has. A somewhat abbreviated statement of what he had to say of the Slate-coloured Boubou as an example of the genus *Laniarius* is as follows: "Toward the beginning of the breeding season the male calls holding himself upright on extended legs; as each note is uttered he depresses the head and body and may swing from side to side. Then he bends forward, depresses his wings and raises the long, fluffy feathers of his rump into a puff above his back. These rump feathers, though blackish at the ends, have white bases, and these are exposed so that the puff has a mottled appearance. The tail is raised and fanned. After a while he takes a short flight from one cover to another, but the wings are quivered rapidly and the puff is expanded."

Puffbacks, in the genus *Dryoscopus*, have similar displays with involved calling, bowing, wing-drooping, tail-fanning and side-to-side swaying, but their rump-puff postures at perches and during short flights are more exaggerated, the long, soft rump



Not all bush-shrike nests are flimsy and untidy. The ***Black-backed Puffback*** *builds a small, neat, deep and well-knit cup, firmly attached to an upright fork in a tree 2–15 m above the ground. The nest is built by the female alone, although the male may provide some material. She undertakes this work mainly in the early morning, making up to 20 visits per day, for the ten days the work takes. She brings spider silk concealed inside her mouth, and slowly brings it out at the nest-site. She first places the silk on the selected site, then puts down a strip of bark, and then works the silk across, fastening it to the substrate. As she builds up the nest, she binds more spiders' web around the supporting fork, and weaves it around the nest. She lines the nest with fine, wiry dry grass, and sits in it and moves around, in order to mould it to the shape of her breast. While the building goes on, the male escorts her to and from the nest, calling and wing-fripping; at this stage he is extremely aggressive towards other birds. The female also undertakes most of the incubation of the clutch of two to four eggs, being fed on the nest by the male, who relieves her for short periods. Both partners initiate "nest-relief", by calling. Incubation takes 13 days. Black-backed Puffback nests are sometimes decorated on the outside with pieces of lichen, dry leaves and bark. Bokmakieries* (Telophorus zeylonus) *sometimes decorate their nests externally with asparagus fern, and Marsh* (Tchagra minutus) *and Black-crowned Tchagras* (T. senegalus) *with fragments of snakeskin.*

[*Dryoscopus cubla hamatus*, KwaZulu-Natal, South Africa. Photo: Hugh Chittenden]



On hatching, bush-shrike chicks are naked and blind, and they are brooded continuously for at least the first five or six days. ***Bokmakierie*** *eggs hatch after between 14 and 19 days, usually 16 days. Both parents incubate the eggs, and both brood the chicks, and take turns in feeding and guarding them. They will often bring more than one item of food in the bill at a time. Both parents also remove the faecal sacs, dropping them a fair distance away. The nestling period lasts from 14 to 21 days, with an average of 18 days. Limited information is available on the development of bush-shrike chicks. One Slate-coloured Boubou* (Laniarius funebris) *nestling weighed 3 g when it hatched, had doubled its weight to 6 g by the third day, and gained weight almost linearly to reach 33 g at day 15. The feather tracts of the boubou's nestlings become apparent on the fifth day and the eyes open on the eighth day. The first feathers to emerge are those of the rump, on or about day nine, and the chick is fully feathered three days later, although the wings and tail are still short. Bokmakieries sometimes build several nests—again, working together—before settling on one. The nest, a bulky, shallow bowl, is placed on the ground, or an average of 60 cm above it on the fork of a branch, in the dense foliage of a bush, hedge or tree. Bokmakieries may be double-brooded in southern Africa, where clutches have been found in every month except April; in fact, a female with oviduct eggs was found in April in Namibia.*

[*Telophorus zeylonus zeylonus*,
Western Cape,
South Africa.
Photo: Will Nichol]



Adult bush-shrikes have four rictal bristles on either side of the gape, which are believed to protect them from damage by the spines on the legs of large grasshoppers. The chicks lack these bristles. ***Brown-crowned Tchagras*** *have been observed to hold grasshoppers in one foot and pull off the legs with the beak, then to pulp the insect's body by passing it to and fro across the bill, before feeding it to a chick. The young bush-shrikes' diet of insects and their larvae and pupae may sometimes be varied by larger items. On one occasion, a Brown-crowned Tchagra was observed to kill, disembowel and pulp a hairless* Leggada *mouse, which it fed to its nestlings; there is an almost identical report for a Black-crowned Tchagra* (Tchagra senegalus). *Other food reported to be given to Black-crowned Tchagra nestlings includes moth caterpillars, grasshopper nymphs, beetles and spiders, and if frogs are breeding nearby, tadpoles are also said to be taken, although it is not known how the tchagra may catch them.*

[*Tchagra australis minor*, Malawi. Photo: Michael Gore]

feathers being all white and puffed out above the back into a half-sphere. In the display-flights they use much bill-clicking and wing-fripping, which are often the immediate prelude to copulation. After copulating, a pair of Black-backed Puffbacks flew a short distance, noisily fripping their wings and calling loudly; perching well above the female in a high tree, the male fluttered down, with quivering wings and puffed-out rump feathers, calling the while, and the two went off to forage in the canopy, the male sometimes feeding his mate with a caterpillar.

Even more spectacular than puffback display-flights are those of tchagras, which are, in addition, more visible since all tchagras prefer open, low-bush habitat types. Brown-crowned Tchagras advertise and defend the territory by means of repeated flight displays. An individual zigzags its way up a large bush, takes off from the top and ascends to some 15 m in a steep jerky flight, noisily fripping its wings. At the apex of its flight it raises its head and its crown feathers, starts to sing, and glides conspicuously down, a little jerkily, the foxy wings outspread and, near the end of the glide, the white-tipped black tail widely fanned. The song of this species is a rapid stuttering trill, which soon changes into a series of up to 30 loud, liquid double whistles that fall in pitch and decelerate towards the end of the glide. The courtship of this species involves repeated aerial displays, the same as the above-described territorial display except that the rump feathers are fluffed up and the tail fanned for longer. At perch, a male postures in front of a female, bowing, stretching his body and pointing the bill upwards, fanning the tail and giving complex calls.

In an appendix in their monograph *Shrikes and Bush-shrikes*, Harris and Franklin presented an exhaustive compilation of the distribution of 140 different characters, a monumental task given that so little is known about many of the species. With regard to the courtship behaviour of bush-shrikes, tandem bouncing through vegetation is performed only by *Dryoscopus*, *Laniarius* and *Chlorophoneus*; all genera except *Chlorophoneus* and *Telophorus* have display-flights, and all or most genera use rump-fluffing to varying degrees, although there is some doubt about *Malaconotus* and *Chlorophoneus* in this respect. Only the Marsh Tchagra flicks its tail up and down, and all tchagras and puffbacks hold the head up in courtship flight. Puffbacks are the only ones in which the male has a special high-pitched nest-building call and escorts the female during nest-building. Courtship feeding has been noted for *Malaconotus*, and occurs regularly in *Dryoscopus*, the males of which regularly give their females an insect, often a caterpillar; courtship feeding may also be practised by Mount Kupe Bush-shrikes and Brubrus.

All known bush-shrike nests are bowl-shaped or cup-shaped structures, rather loosely built, and placed in bushes or trees, generally on the fork of a stout or slender branch. The base and walls are untidily and rather roughly made, those constructed by the large *Malaconotus* species consisting of thin licheny branched twigs, whereas those built by others are of various thinner and more pliable plant materials; the lining is neater, a profusion of even more slender plant material such as dry rootlets, not woven in but, instead, curved around to give a fairly strong and durable structure. No soft inner padding of feathers, animal hairs or plant down is ever added.

Most *Tchagra* nests and some *Laniarius* and *Chlorophoneus* nests are flimsy and shallow, quite like dove (Columbidae) nests. *Dryoscopus* species and Marsh Tchagras use spider web to bind their nests, and *Tchagra*, *Dryoscopus* and *Laniarius* species often incorporate pieces of bark. Marsh Tchagras are unusual also



*Although the **Grey-headed Bush-shrike** may lay as many as four eggs, no more than three ever seem to hatch. By the time three young reach the age of 14 days, or two get to 20 days, they can be far too big for the nest, and one or two may fall from it and die. Several bush-shrikes also have their eggs or young ejected by brood parasites such as Black Cuckoos* (Cuculus clamosus) *or Jacobin Cuckoos* (Clamator jacobinus). *Commonly building their own nests, Grey-headed Bush-shrikes may alternatively occupy the old nests of doves (Columbidae), sparrowhawks* (Accipiter) *or Grey Go-away-birds* (Corythaixoides concolor). *One was seen to destroy the nest of an African Thrush* (Turdus pelios), *taking away the material.*

[*Malaconotus blanchoti hypopyrrhus*, Marondera, Zimbabwe. Photo: Peter J. Ginn]

in that they often decorate their nests with one or two pieces of discarded snakeskin, or a few snakeskin scales. As described by Vincent, the nest of the Black-backed Puffback "is firmly attached to the fork by cobweb and plant-fibre... a neat and compact little cup, thickly built at base, of thin wood-shavings and dry fibrous grass-blades, round which is bound cobweb, snowy-white cocoon-webbing and some woolly plant-down, and with a lining of small strips of coarse dry grass or fine wiry dry grass". The nest of the Black-backed Puffback is built by the female alone, although her mate sometimes brings material to her. She undertakes this work mainly in the early morning, making up to 20 visits per day, and using material carried in her bill; she brings spider silk concealed inside her mouth, and at the nest she slowly brings this out and weaves it around. The work takes her about ten days, the male escorting her to and from the nest, while calling and wing-fripping; at this stage he is extremely aggressive towards other birds. The female first places spider web on the selected site, puts down a strip of bark, and then works the web across, fastening it to the substrate; as she builds up the nest, she binds spider web around the supporting fork. She sits in the nest and moves around, moulding it to the shape of her breast. The completed nest is firmly knit, and bound with spider web on the outside; bits of bark and lichen are worked in and held by cobweb, sometimes with cocoons still attached.

Brubru nests are small, slight structures, built mainly from leaf petioles bound and moulded on to the supporting branch by spider web, and marvellously camouflaged with bits of lichen copiously applied all around, often joining up with lichen growths on the branch itself. White-tailed Shrikes make a small, thick-walled nest generally of dry grass, smoothed on the outside with finely shredded, cotton-like bark fibres, usually matching the colour and texture of the branch to which the nest is moulded. The sexes of the Brubru take equal parts in the task of building, the two collecting material and visiting the site independently; if both arrive at the same time, one waits until the other has finished adding material, which takes 30–60 seconds. The individual bringing material first sits on the nest and then places material on the rim, using its bill repeatedly to tamp down the material and rotating its body through some 30° in order to compact the wall. It then drops down on to its breast and uses its feet to compact the inner side by means of a treading motion and body rotation. One individual which was collecting petioles of *Peltophorum africanum* flew with a beakful to a nearby spider web, where it gathered web on to the petioles before taking them to the nest.

With the exception of the puffbacks, the males of all bush-shrikes help their mates in the task of nest-building. Failed nests are sometimes pulled apart by their owners, perhaps for use in rebuilding.

Most malaconotid species have clutches of two or three eggs, laid at 24-hour intervals. Complete clutches containing a single egg or four eggs are rare, but Grey-headed Bush-shrikes lay clutches of three or four and, sometimes, two or five eggs. The eggs of this family have a creamy, pale grey, pinkish or pale greenish-blue background, generally finely speckled at the small end but the rufous-brown markings becoming more blotchy or scrawled at the large end, where, in the case of puffback eggs, they may form a distinct ring. Interestingly, the Black-crowned Tchagra lays eggs of two types in Nigeria. Most of its eggs are white, scrawled or irregularly streaked or smudged with claret, red-brown markings forming a ring around the large end; the less common type has the same colours but the red-brown forms blotches or spots, chiefly at the large end.

For some malaconotids incubation begins with the first egg laid, but most of the species start to incubate only when the clutch is completed. In the case of the puffbacks, the Grey-headed Bush-shrike, the Black-crowned Tchagra and the White-tailed Shrike, incubation is undertaken solely or mainly by the female. With all other bush-shrikes, so far as is known, the male and the female take practically equal shares in the tasks of incubating the eggs, brooding the young and feeding the nestlings and fledglings.

On hatching, malaconotid chicks are naked and blind, and they are brooded continuously for the first five or six days or more, but little is known about their development. Data are available for the Slate-coloured Boubou, whose hatchlings have black naked skin and conspicuously yellow gape flanges. One nestling of this species weighed 3 g when it hatched, had doubled its weight to 6 g by the third day, and gained weight almost linearly to reach 33 g at day 15. The feather tracts of this boubou's nestlings become apparent on the fifth day and the eyes open on the eighth day; the first feathers to emerge are those of the rump, on or about day nine, and the chick is fully feathered three days thereafter, although the wings and tail are still short. The chick exer-



*The **Southern Boubou** clutch of two to three eggs is incubated by both parents, with incubation starting as soon as the first egg is laid. The eggs hatch after 16–17 days, and the eggshells are eaten or, more usually, carried away in the adult's bill immediately afterwards. The chicks are fed by both parents. At one nest, one or the other parent constantly brooded the chicks for eleven days, and both fed the young thereafter. The faecal sacs are either carried away by the adult, or swallowed immediately. The nestling period is 16 or 17 days. At one nest, two young birds, of 16 and 17 days old, left the nest on the same morning, within two hours of each other. The nest of this species can be particularly flimsy, no more than a loosely knit bowl of slender twigs, roots and grasses, sometimes bound with spiders' web and lined with finer grass and rootlets; sometimes no twigs are used, and the nest is so thin that the eggs are visible from below. The nest is, however, usually well concealed, placed around 2 m above the ground in a fork in a dense bush or a mass of creepers. The pair will destroy the nest if too much disturbed, and may use the material to build another. Pair members will defend their territory throughout the year, with repeated loud ringing whistles, given mainly by the male while in an upright stance, bobbing his head slightly and with half-open tail, semi-exposed on an elevated perch. They become very aggressive towards others of their species during breeding, chasing them and plundering their nests. As with other species of bush-shrike, courtship seems to be indistinguishable from displays against rival birds. The male and female sway, and move close together, hopping, creeping and winding through the bush, fripping wings and duet-singing. In the display-flight, the male descends with slow, exaggerated wingbeats, head held up and rump feathers fluffed.*

[*Laniarius ferrugineus*, KwaZulu-Natal, South Africa. Photo: Hugh Chittenden]



Initially the female ***Black-backed Puffback*** *broods the chicks, feeding them with food brought by the male. Later in the nestling period, both parents feed the young, and both remove the faecal sacs. Food items given to nestlings include butterflies and moths, noctuid and saturnid moth caterpillars, long-horned grasshoppers and crickets, dragonflies, beetles, larvae, worms and small lizards, and once a stick-insect 115 mm long, from which the legs had been removed. The nestling period lasts around 18 days. Nestlings are sometimes killed by ants. Black-backed Puffbacks' nests are occasionally parasitized by Klaas's Cuckoo* (Chrysococcyx klaas)*, and possibly by African Emerald Cuckoos* (Chrysococcyx cupreus) *and Black Cuckoos* (Cuculus clamosus)*. In other species, breeding success can be variable, and is often poor. In the Crimson-breasted Shrike* (Laniarius atrococcineus)*, for example, which is heavily parasitized by the Black Cuckoo, two out of a brood of three will often die in the nest, in one instance because of infection by mites* (Ornithonyssus bursa)*. In one study of the Crimson-breasted Shrike, only seven broods fledged from 66 clutches, and in Nylsvlei, Limpopo Province, South Africa, only one young fledged from 13 clutches. A similar study of the Brubru* (Nilaus afer) *found that out of ten nests, only three were successful. Of 17 nests of the Slate-coloured Boubou* (Laniarius funebris) *at Lake Baringo, in Kenya, none was successful. Twelve clutches and five broods disappeared, with most nests remaining untouched. Predation by Nile monitors* (Varanus niloticus) *was believed to be responsible. However, another nest of this boubou was so poorly bound that it collapsed under the weight of the growing young.*

[*Dryoscopus cubla hamatus*, Marondera, Zimbabwe. Photo: Peter J. Ginn]



*This well-grown **Brown-crowned Tchagra** chick is seen with a parent bird in the act of removing a faecal sac. The nestling period is around 15 to 16 days. There are no data on fledging in this species, but in the Slate-coloured Boubou* (Laniarius funebris), *the chick is fully feathered at around twelve days, although the wings and tail are still short. The chick exercises by preening and stretching its legs and wings. It is able to fly a few days later. Young Brown-crowned Tchagras remain with the parents in a family party for at least five months. In Malawi, they probably become independent at six to seven months.*

[*Tchagra australis australis*, Modimolle, Limpopo, South Africa. Photo: Warwick Tarboton]

cises by preening, stretching its legs and wings, and standing, when it sometimes overbalances. It begs with plaintive "seee" calls. It is fully capable of flight a few days after leaving the nest, even though its tail is still very short.

In southern Africa, 2–2·5% of the nests of Tropical Boubous, Southern Boubous and Crimson-breasted Shrikes suffer brood parasitism by Black Cuckoos (*Cuculus clamosus*). The eggs of this cuckoo are similar to the bush-shrike eggs, although a little larger.

Movements

No species in this family is migratory in the conventional sense of the term. Most appear to be sedentary throughout their ranges, and paired individuals that occupy a territory throughout the year are strictly so, perhaps moving no more than a kilometre from the centre of the territory during the course of their lifetimes. This will apply particularly to populations living in rainforest and mesic woodlands that are not subject to marked seasonal micro-climatic or vegetational fluctuation. Some peripheral populations of the same essentially sedentary species, however, may well move a few kilometres seasonally in response to drying conditions, fire, rain or flooding. Bush-shrike species regarded as "resident", in the sense that some individuals are nearly always to be found in a particular region even if those present in the dry season are exclusively different from wet-season ones, are likely to exhibit post-fledging dispersal of several kilometres, as well as having non-breeders roaming over somewhat greater distances.

Long-term ringing studies undertaken in hot and humid *Acacia–Combretum* woodland near the Zambezi River in Malawi and Mozambique have produced strong circumstantial evidence for short-distance migration by parts of populations that are otherwise more or less sedentary. It seems that young Tropical Boubous and Black-backed Puffbacks disperse from their natal areas 5–6 months after fledging, most Tropical Boubous moving away after a year or two, resulting in a constant turnover of individuals in the area; some adult Southern Puffbacks stayed in their breeding territories for five years, but others passed through the trapping area in October and November and were not seen again. In southern Africa, a male Southern Boubou remained in the same territory for 11 years, and recoveries of 17 ringed bush-shrikes, of four species, were all within 15 km of the ringing station and mainly within 2 km of it.

Also in southern Africa, detailed analysis of field counts has suggested that Crimson-breasted Shrikes may move into riverine woodland during prolonged droughts, but no evidence was found that might corroborate earlier suggestions of seasonal movements by Gorgeous, Olive or Grey-headed Bush-shrikes. The last-named species, however, is a partial migrant in West Africa: moving north with the rains, it arrives in the Bamako region of Mali in March, probably breeds then, and departs in October, although farther south, in northern Guinea and northern Ivory Coast, it seems to be resident. Its most northerly records in Nigeria are during the rains, while coastal records of this species in Ghana are in the dry season. Field observations strongly suggest that Orange-breasted Bush-shrikes migrate likewise, at least in Ghana, Nigeria and Sudan. In Malawi, Black-fronted Bush-shrikes wander a few kilometres to small patches of forest where they do not breed, and some may move 60–100 km, while in Tanzania they are generally thought to be altitudinal migrants through 1000–2000 m in the Uluguru and East Usambara Mountains. In Tanzania Olive Bush-shrikes behave similarly, and so, probably, do Fülleborn's Boubous, too.

Relationship with Man

Members of the family Malaconotidae are of no commercial interest and of very little cultural interest to humanity. The great majority of bush-shrike species are unobtrusive, shy or even secretive birds of dense and gloomy forest undergrowth, thickets and leafy trees. They are not gregarious, nor are they conspicuously migratory, and on the whole they seldom impinge upon the lives of people in any way. Beautiful as many species are, and interestingly vocal as well, no malaconotid species has ever been systematically trapped for the cagebird trade. Perhaps a major reason for the lack of interest by aviculturalists is that bush-shrikes are primarily insectivorous, making them difficult to keep in captivity, especially outside the tropics. On the edges of various African cities and towns, one species or another, particularly the boubous of the genus *Laniarius*, will enter gardens and sometimes even make brief appearances into bright sunlight in order to forage near bushes around the edges of lawns. Even boubous, however,



Once young ***Black-backed Puffbacks*** *leave the nest, they continue to beg from their parents and be fed by them for at least three weeks. Juveniles appear to be tolerated in the parental territory until the next nesting season. Up to 15 individuals of this species, all or most of them juveniles, sometimes congregate noisily in trees, displaying their rump feathers, calling, wing-fripping and chasing each other. These aggregations are, however, exceptional. Although generally aggressive to conspecifics, bush-shrikes seem to tolerate the presence of the young within their territories for a few months, or at least until breeding begins again. Young Tropical Boubous* (Laniarius aethiopicus) *and Black-backed Puffbacks seem to disperse from their natal areas five to six months after fledging. Red-eyed Puffbacks* (Dryoscopus senegalensis) *remain with their parents almost until the next nesting attempt. There is little information on dispersal, but the birds do not appear to go far: recoveries of 17 ringed bush-shrikes, of four species, were all within 15 km of the ringing station, and mainly within 2 km of it. The bush-shrikes sometimes seen foraging in mixed flocks may well be unestablished juveniles rather than territory holders, but this has not been investigated. There is no incontrovertible evidence of co-operative breeding by any species of bush-shrike. This is so widespread a phenomenon among birds in hot climates and relatively aseasonal habitats that it would not be unexpected, even though bush-shrikes are rarely seen in groups of three or more individuals. Third individuals have been seen at the nests of pairs of Crimson-breasted Shrikes* (L. atrococcineus), *but they have not been observed to help in any way with the rearing of the young.*

[*Dryoscopus cubla hamatus*, Marondera, Zimbabwe. Photo: Peter J. Ginn]



Two-day-old ***Tropical Boubou*** *nestlings are fed with grasshoppers, mantids and moth larvae. At seven days old, their diet begins to include items such as tree-frogs and skinks, and nestling Common Waxbills* (Estrilda astrild). *One parent brought a 30-cm tree-snake, putting one end in the mouth of one nestling, and the other in the mouth of another, which, but for the intervention of the observer, might have killed both. The young leave the nest at around 15 days, and can feed themselves after a further seven weeks, but they remain with the parents for five months, by which time they have acquired most of the adult vocabulary.*

[*Laniarius aethiopicus ambiguus*, Arusha National Park, Tanzania. Photo: Anabel Harries]

very seldom venture close to human habitation to take morsels from birdtables. Members of this family do not nest on or otherwise utilize man-made structures. While several species can be found in and around traditional farms, none has ever been regarded as a pest. Indeed, the insectivory of malaconotids would probably make them welcome, if anything, in the eyes of fruit-farmers and market gardeners.

Bush-shrike species are not known to make good eating, and they are not hunted or trapped in any numbers. Admittedly, some species often feature in traditional African magico-medicine markets, but probably not disproportionately when compared with the myriad other animals the remains of which are offered for sale there. Dried Black-headed Bush-shrike corpses occur quite commonly in market fetish stalls throughout the southern halves of Togo, Benin, Nigeria and Cameroon. In Benin, during a survey made in the large Dantokpa market, in Cotonou, where over 7000 birds were examined, there were no fewer than 19 Many-coloured Bush-shrikes, 22 Northern Puffbacks and 60 Black-crowned Tchagras. Besides corpses, live birds are offered for sale in these West African markets, but since the handling of them is generally brutal, and little or no care is taken with captives, any bush-shrikes caught alive would not last for long. Most passerine birds are, in any case, not trapped live, but are shot or are killed by catapult.

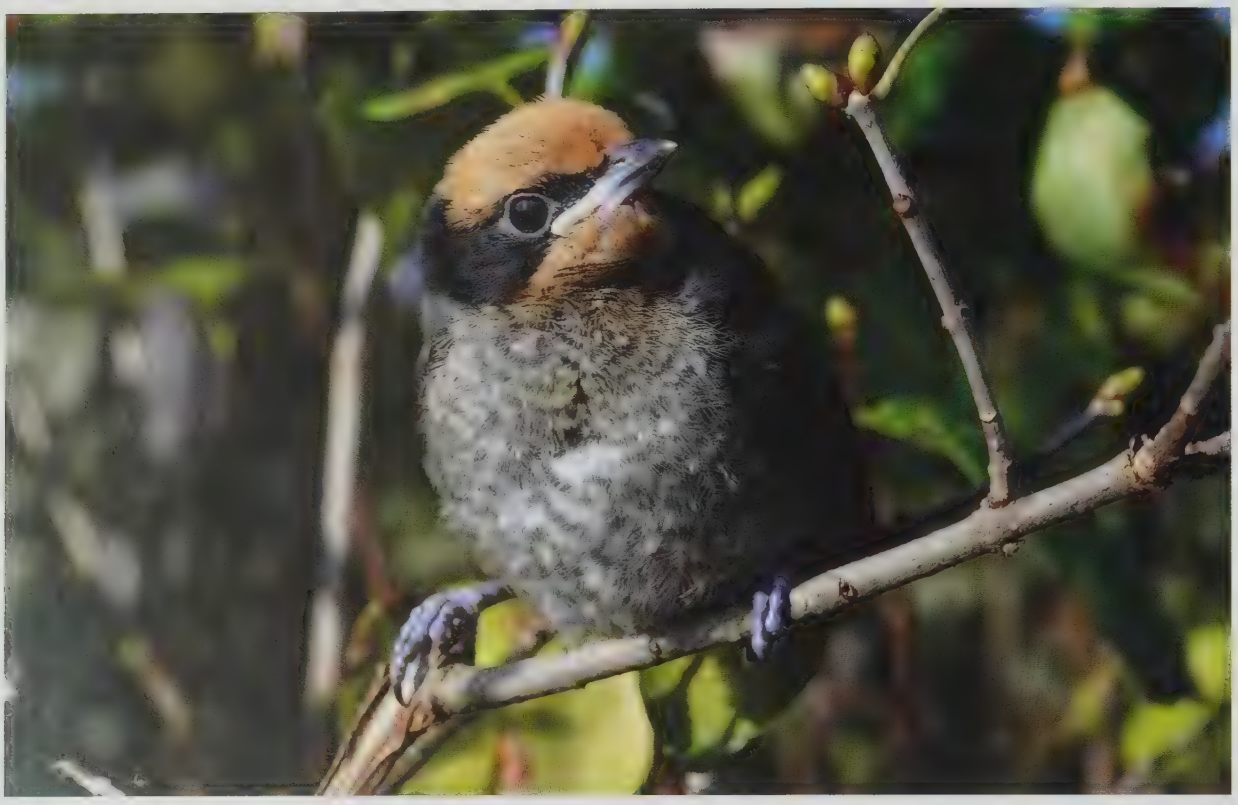
The very word "shrike" has entered literary English having derived perhaps from the Anglo-Saxon *scric*, for a bird that screeches, by way of "shrite", used in seventeenth-century to nineteenth-century England first for the Mistle Thrush (*Turdus viscivorus*), later for the Red-backed Shrike (*Lanius collurio*), and currently for a host of passerine families the members of which possess a hook-and-tooth-tipped bill. Bush-shrikes, with their strikingly loud, varied and always attention-demanding voices, have compounded vernacular nomenclature in interesting ways. Until quite recently, the name of "Bell-shrike" was widely used in anglophone Africa for several boubous. As recounted by D. A. Bannerman in *The Birds of Tropical West Africa*, the voice of "Turati's Bell-shrike", now known as Turati's Boubou, was described in 1914 as beginning "with a kind of harsh creaking note something like the grating of a rusty hinge... followed by a clear musical note almost exactly like the sound produced by rubbing a wet finger round the edge of a glass finger-bowl", and at first the experienced naturalist G. L. Bates supposed the double-chime call of the "West African Bell-shrike", today's Tropical Boubou, "to be the bell of a mission-school in some village out of sight".

A good number of bush-shrike species were discovered by F. Levaillant, the extraordinary traveller-naturalist who explored the South African region then known as "Cape Colony" in 1781–1784. To several malaconotids he gave onomatopoeic names in his native French — *Le Boubou*, *Le Brubru*, *Le Tschagra* and *Le Bacbakiri* — which quickly entered English usage and remained the definitive vernacular names, the last two, of course, as "tchagra" and "Bokmakierie". The name "gonolek", too, is almost certainly onomatopoeic, and it is surely the case that names in many African languages similarly have a sound-imitative origin, examples being *Bubu* and *Katcha* in the Mandingo tongue in Mali.

Several colloquial names in Afrikaans are colourfully descriptive. For instance, *Spookvoël* refers to the Grey-headed Bush-shrike, alluding to its haunting ghostly calls, *Sneeubal* to the Black-backed Puffback, the snowy rump feathers of which are often fluffed up into a half-snowball, and *Waterfiskaal* to the Southern Boubou, this being a reference to "its rapacity, which no revenue-officer could exceed". The name "fiscal" is applied to some *Lanius* shrikes, as well.

In the world of art, perhaps such beautiful birds as the Fiery-breasted, Many-coloured and Gorgeous Bush-shrikes, the Rosy-patched and Crimson-breasted Shrikes and the Bokmakierie have not made so much of a mark as might be imagined, although G. Arnott's lovely portraiture in his and Harris's *Shrikes of Southern Africa* is certainly well deserving of special mention.

By far the most important place of this family in human affairs lies in its popularity among ornithologists and biologists. Because many bush-shrikes are extravagantly coloured and patterned, they are sought out by birdwatchers and always admired when seen. It is, however, the synchronous or antiphonal male–female duets with astonishingly short auditory reaction times of many species that have excited much research attention in the field, investigators having used increasingly sophisticated methods in interpreting the adaptive functions of duetting and thereby building upon ever more detailed ideas about evolutionary sociobiology. Bush-shrikes are set to become some of the most important of birds worldwide as subjects for further comparative researches into the role of behavioural communication in avian social systems.



*Little is known about the breeding of the **Yellow-crowned Gonolek**, other than that it breeds primarily in the wet season, builds a cup-shaped nest of loosely intertwined coarse grass stems several metres up in a thicket, and lays at least two eggs. This fledgling will soon acquire a mustard-yellow crown, and ochre-yellow underparts, which in turn will acquire a scattering of red feathers, starting mainly on the throat and lower belly. No information is available on survival in this species, but in other bush-shrike species, at least six years seems typical.*

[*Laniarius barbarus barbarus*, Senegal. Photo: Roland Seitre]

Status and Conservation

To read the accounts of ornithologists in the early or middle twentieth century studying birds all over sub-Saharan Africa, one might suppose that a great many species, including the bush-shrikes, were a good deal commoner then than they seem to be in many countries now. In the absence of earlier population-density estimates, it is perhaps questionable whether there really have been regional decreases in abundance, as perceived decreases in the numbers of some species may have something to do with the nature of field studies and the manner in which they are published. Nevertheless, it is likely enough that widespread declines have taken place, considering how widespread has been the destruction or modification of forest and woodland by man across the continent. Furthermore, this process of habitat change continues to accelerate with the demands of human population growth, agricultural, industrial and urban development and, it must be said, the desperate poverty that forces millions of people to cut trees for fuel and to exploit the natural environment in ways that not only are quite unsustainable but also are, in all practical regards, irreversible. Fortunately, most bush-shrike species, in common with other African woodland birds, have large or vast ranges and remain not uncommon, so that they are not of any immediate conservation concern. Moreover, several of them readily extend from natural woodland into secondary vegetation in farmland, plantations and wooded gardens and suburbs, where they thrive.

Of the 48 species of Malaconotidae currently recognized, five are listed as globally threatened. One of these is Critically Endangered, three are Endangered, and one is Vulnerable. A further two species are considered to be Near-threatened. Several others, obligate inhabitants of lowland rainforest which, at least in Africa west of Cameroon, has already become dangerously fragmented, are of regional conservation concern in the long term. Sabine's Puffback, for instance, inhabits lowland primary and secondary forest from Sierra Leone east to the eastern and south-western borders of DRCongo; in some countries it is still quite common, but in large parts of this great range it appears to be rare. Sabine's Puffback is known from 35 localities throughout Liberia, and from ten forests in Ivory Coast, where it is still quite frequent in Taï Forest and Banco National Parks, Yapo and Bossematié, while in Ghana, where in the 1870s it was said to be locally very common, it had by 2005 been reduced to being common in six selectively logged reserved forests, frequent in two and uncommon in seven others; it is very rare in Togo and Benin, uncommon in Nigeria's remaining coastal forests, uncommon or locally quite frequent in Cameroon, Gabon and PRCongo, and uncommon to rare, or, perhaps, widely overlooked, in DRCongo. Estimated densities of 2–5 pairs of Sabine's Puffbacks per 100 ha in Liberia and 8–10 pairs per 100 ha in Gabon sound healthy enough, but the long-term future of this and all other tall-forest endemics can be secured only by effective preservation and management of as many forests as is practicable. The same applies to other species confined to lowland or montane forest, particularly those with a lesser range than that of Sabine's Puffback or with a patchier distribution, such as the Fiery-breasted and Doherty's Bush-shrikes, the Mountain and Fülleborn's Boubous and the Black-shouldered and Pink-footed Puffbacks.

Most of the species of immediate conservation concern also inhabit forest, mainly in small montane isolates. Only the Papyrus Gonolek, which is listed as Near-threatened, has a markedly different habitat, being restricted to the interior of papyrus swamps. Recently, it was locally common in central and south-west Uganda from the shores of Lake Victoria up to about 1600 m in altitude, and perhaps it still is, but many papyrus marshes on the shores of this great lake are suffering from intensification of fishing and agriculture, incursions by cattle and goats, papyrus-harvesting, burning, pollution and, perhaps worst of all, falling water levels; in the last decade or so, the surface of Lake Victoria has fallen by a metre. Papyrus Gonoleks are widespread and locally abundant in eastern Rwanda and eastern Burundi and occur also in extreme north-west Tanzania and extreme western Kenya, where there may still be 6–10 individuals per hectare in unaffected papyrus swamps. In Uganda, a density of 13 birds per hectare was found in the centre of undisturbed swamps but less than one bird per hectare in degraded swamps. Populations may not be at immediate risk, but the species is in urgent need of monitoring, with a view to the establishing of conservation action for it and its habitat.

Lagden's Bush-shrike, with one subspecies ranging in lowland rainforest from Sierra Leone to Ghana and another, moderately distinct, from eastern DRCongo to Uganda and Rwanda, has also been classified as Near-threatened. It is widespread but uncommon in Liberia, with an estimated 6000 pairs, uncommon

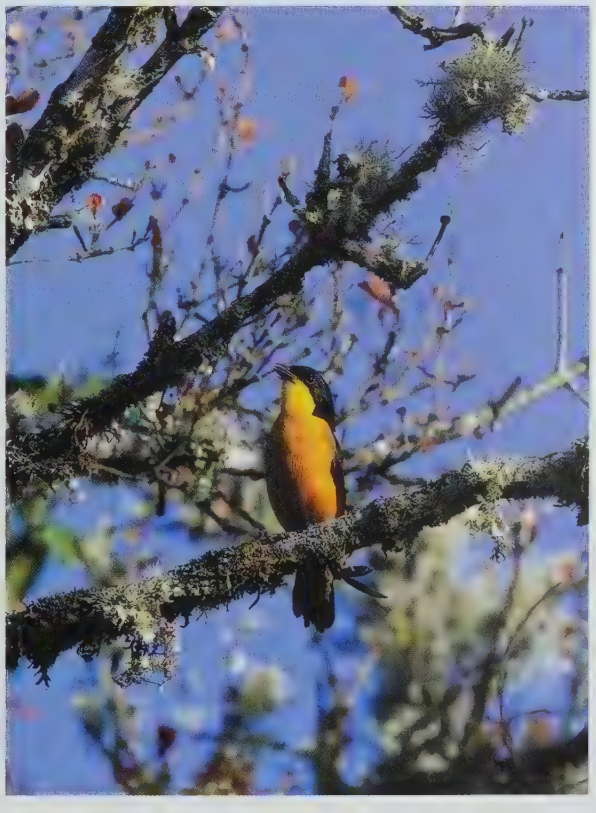
in Ivory Coast, where it is known only in Taï, Mopri and Yapo Forests, possibly extinct in Ghana, and known in Togo from a single sight record in 1990. More montane in East Africa, it is uncommon in south-western Uganda and along the eastern borders of DRCongo at about 1400–2700 m and is known to occur in Rwanda at only five localities. Being so retiring and elusive, Lagden's Bush-shrike may be commoner than the sparse observations of it suggest, but forest destruction is bound to affect it adversely. Even though it may be capable of extending into secondary, degraded forest habitats, this splendid large bush-shrike should be added to those others in the genus *Malaconotus* the survival of which should be helped along by means of effective protection of evergreen forest.

At least two, and almost certainly three, other *Malaconotus* species are very much at risk. These are Monteiro's, Green-breasted and Uluguru Bush-shrikes. So, too, is the Mount Kupe Bush-shrike, formerly regarded as a *Malaconotus* but now placed tentatively in *Chlorophoneus* (see Systematics). Monteiro's Bush-shrike is something of a special case, since it is sometimes thought to be not a distinct species in its own right but, rather, a forest subspecies of the savanna-woodland Grey-headed Bush-shrike or even a colour variant of the Green-breasted Bush-shrike. It is a rare and elusive bird of the scarp forests of Angola, with an even smaller population in Cameroon. A Kenya specimen, now lost, and one from Kivu, in east DRCongo, have also been linked with Monteiro's Bush-shrike. This species is listed as Data-deficient, but is thought probably to be Endangered and of global conservation concern, being biome-restricted and of restricted range. The nominate subspecies was known from six old specimens and a handful of sight records up to 1957, but it was rediscovered in 2001–2003 and found to be surprisingly common locally in primary forest and secondary scrub in Kumbira Forest, on Mount Njelo, in Cuanza Sul. Widespread destruction of forest in Angola has doubtless compromised the survival prospects of this bush-shrike, which seems always to have been thinly distributed. In south-west Cameroon, after the type of the mysterious *perspicillatus* was collected on Mount Cameroon, there were no further records for a century, but then one was seen in 1992 on Mount Kupé, another in 1997, and one or two more in the Bakossi Mountains, also in 1997. In Angola, Monteiro's Bush-shrike may occur in Reserva do Ambriz, north of Luanda, but no relevant information is available from there. In Cameroon, surveys are required in order to confirm its occurrence on Mount Kupé and its continued existence on Mount Cameroon.

The Green-breasted Bush-shrike, listed as Vulnerable, is a hill-forest species, rare in much of its restricted range in western Cameroon, where it is found from Mount Cameroon and the Rumpi Hills north to the Bamenda-Banso Highlands, and in south-east Nigeria, where it is confined to the Obudu Plateau. In Cameroon, it is moderately common at 1100–1400 m in the Bakossi Mountains, where at least six territorial individuals or pairs were found in 1998 in less than 100 hectares of forest–grassland mosaic near Kodmin; it is also not uncommon around Lake Edib, and on nearby Mount Kupé at 1100–1950 m and Mount Nlonako at 1400–1600 m. In the Bakossis, there appear to be good numbers of this bush-shrike around Bali-Ngemba, but the species is rare in the Kilum-Ijim forests at 2250 m, while on the summit of Mount Oku, where conservation projects have been carried out for the past 20 years, Green-breasted Bush-shrikes have been seen only in 1984 and 1998. Middle-altitude forests in this part of Cameroon have been degraded by logging and shifting agriculture; this species is among those of greatest conservation concern, for which BirdLife International's Kilum-Ijim Forest Projects and, in 1991, the Mount Kupé Forest Project were initiated. In Nigeria, forest loss on the Obudu Plateau, already extensive, is continuing at an alarming rate; although a small forest patch has been established as a reserve, the security of this bush-shrike there depends on the protection of further forest areas on the plateau.

Distinctively different from its congeners, the Uluguru Bush-shrike is a Critically Endangered species, restricted to the forested peaks of the Uluguru Mountains, in east Tanzania, where it is elusive and rare. The Ulugurus are in two main massifs, one northern and the other southern. The species had only once been reported on South Uluguru until 2007, when two or three pairs were found. In 1948 one had been found 3 km away at Bunduki, at 1500 m on the saddle between the South and the North Ulugurus, now a tiny and badly damaged forest reserve. North Uluguru is a narrow ridge 25 km long, the highest peak at 2360 m, with Mount Lupanga at the north end rising to 2138 m and only 2 km from the large and populous town of Morogoro. By the 1980s, the luxuriant evergreen forest at 800–1500 m had been largely cleared for cultivation; between 1500 m and 1800 m there remains submontane forest, which gives way to wet moss forest up to the highest peaks. In North Uluguru, this striking bush-shrike was encountered in 1981 and 1982 at 1300 m, with several at about 1800 m near Bagilo, only 9 km south of Morogoro. In 1993, three or four territorial pairs were found during two months of fieldwork on the eastern slopes, and the total population was estimated to number 1000 pairs. Forest cover in the Ulugurus had been reduced by felling for agriculture to about 220 km² by the year 2000, and is now nominally protected in two reserves, namely Uluguru North and Uluguru South Forest Reserves, formerly adjoining but presently separated by 2 km of farmland. In 1999–2000, a detailed survey, using tape playback, failed to encounter any Uluguru Bush-shrikes in Uluguru South, but several were found in the Uluguru North Forest Reserve, an area of 83·6 km², which was estimated to hold about 1200 pairs, mainly at 1200–1700 m. Submontane forest was still being destroyed at an alarming rate in the closing years of the twentieth century, and in 1999 a three-year conservation action plan was initiated by the Royal Society for the Protection of Birds and by the European Union in collaboration with local organizations and communities. While lower forests continue to be modified by underplanting with banana and other cash crops, the resilience of other *Malaconotus* species to forest-habitat modification suggests that this grossly threatened bush-shrike may yet be able to sustain itself. Surveys in 2006 and 2007 indicated that the global population was much the same as that found in the 1999–2000 survey.

Another seriously Endangered species is the enigmatic Mount Kupe Bush-shrike. It was discovered on Mount Kupé, in south-western Cameroon, in 1951. Extensive searches by the ICBP Cameroon Montane Forest Survey in 1984, however, failed to rediscover it, but the species came to light again in 1989, and in the ensuing five years there were some 40 sightings on Mount Kupé at 1220–1310 m; in March–May 1997, there were believed



Most bush-shrike species have large ranges, and are not of any immediate conservation concern. A few have more restricted ranges. The ***Yellow-breasted Boubou*** *is confined to the Cameroon Mountains Endemic Bird Area, where it varies from not uncommon to abundant: at 2000–2900 m on Mount Oku. It is so abundant in nearby Big Babanki that it can be seen or heard constantly. Three other restricted-range bush-shrikes are found in the same EBA: the Endangered Mount Kupe Bush-shrike* (Chlorophoneus kupeensis)*, the Vulnerable Green-breasted Bush-shrike* (Malaconotus gladiator)*; and the Data-deficient Monteiro's Bush-shrike* (M. monteiri).

[*Laniarius atroflavus*, Obudu Plateau, Nigeria. Photo: A. P. Leventis]



Most of the species of immediate conservation concern, like the Mount Kupe (Chlorophoneus kupeensis), *Green-breasted* (Malaconotus gladiator) *and Uluguru* (M. alius) *Bush-shrikes, inhabit small, isolated montane forests, which are subject to increasing pressure from logging, clearance for agriculture, and in the long term, climate change. The* ***Papyrus Gonolek****, which is listed as Near-threatened, has a markedly different habitat, being restricted to the interior of papyrus* (Cyperus papyrus) *swamps and beds, beside meandering rivers and along lake shores. Its abundance is directly related to the height and density of papyrus, with numbers larger in taller and denser stands. In 2008, the population estimate was of 2,000,000 adults. It was—and may still be—locally common in central and southwest Uganda, from the shores of Lake Victoria up to about 1600 m in altitude. But many papyrus marshes on the shores of this great lake are suffering from the adverse effects of increasing human population, including intensification of fishing and agriculture, incursions by cattle and goats, papyrus-harvesting and burning, pollution and, perhaps worst of all, falling water levels. In the ten years from 1998, the level of Lake Victoria fell by about one metre. Papyrus Gonoleks are widespread and locally abundant in eastern Rwanda and eastern Burundi, and occur also in extreme north-west Tanzania and extreme western Kenya. In Uganda, a density of 13 birds per hectare was found in the centre of undisturbed swamps, but less than one bird per hectare in degraded swamps. Populations may not be at immediate risk, but the species is in urgent need of monitoring, with a view to implementing conservation action for both the bird and its habitat.*

[*Laniarius mufumbiri*,
Lake Victoria,
close to Kampala,
Uganda.
Photo: Warwick Tarboton]



*The Vulnerable **Green-breasted Bush-shrike** was intended to benefit from BirdLife's Kilum-Ijim Forest Project in Cameroon, but has only been seen there twice in 25 years. It occurs at low densities at a few rapidly degrading montane forest sites in western Cameroon and eastern Nigeria. This species must be on the verge of extinction on Cameroon's Mount Oku, as there is almost no forest remaining within its altitudinal range. It may benefit from a small forest reserve on Nigeria's Obudu Plateau, where it is hoped more forest can be protected.*

[*Malaconotus gladiator*, Bakossi Mountains, Cameroon. Photo: Ron Hoff]

to be up to seven pairs along two mountain trails, the combined length of which is about 8 km. In 1992, Mount Kupe Bush-shrikes were discovered on Mount Bakossi, with several seen at 1150–1200 m near Kodmin, Lake Edib and Messaka; the population there may be only about 50 pairs. Some were found in Banyang Mbo Wildlife Sanctuary, a forested extension from the Bakossi hills, in 1999. Using tape playback, ornithologists searched for the species but did not find it, either on the lower slopes of Mount Nlonako in 1999 or on Mount Manenguba in 2000. Concern for its survival in the face of continuing forest destruction led to the inauguration of the Mount Kupé Forest Project by BirdLife International in 1991; the project involves local communities in education, forest conservation and the development of ecotourism, administered from a World Wildlife Fund office located high on Mount Kupé. Nevertheless, some forest was lost at 1250 m there in 1998. Like most other bush-shrikes, this species is elusive and may yet prove to be commoner than is supposed. It is encouraging that, in 2004–2005, this iconic bird was reported from a new locality, the Cross River National Park, in extreme south-east Nigeria.

The final two malaconotid species of conservation concern are in the genus *Laniarius*. Braun's and Gabela Bush-shrikes are, respectively, red-breasted and white-breasted versions of the brown-breasted Lühder's Bush-shrike of western and eastern Congo Basin rainforests; formerly treated as subspecies of the latter, they are now usually accorded full species status on account of their distinctive appearance. Each inhabits undergrowth in separate tiny areas of evergreen escarpment forest in north-west Angola, Braun's Bush-shrike 300–350 km south of the range of Lühder's, which does not occur south of the River Congo, and the Gabela Bush-shrike about 270 km south of Braun's. Both are Endangered.

Braun's Bush-shrike is known from very few historical specimens and sightings at six localities at elevations of 600–1265 m close to Camabatela, an Important Bird Area (IBA) in northern Cuanza Norte. In January 2005, three pairs were found when duetting in a small patch of degraded forest at one of the six localities, 30 km south of Uíge. Almost nothing is known about the present status of the Camabatela Forests IBA; the forests have been heavily logged, and by the early 1970s much escarpment forest had been replaced by coffee plantations. During the lengthy civil war in Angola, coffee *fazendas* were neglected and coffee production declined; the forest bird fauna, which had become fragmented and reduced, may well have benefited somewhat.

The Gabela Bush-shrike was discovered near Gabela, in western Cuanza Sul Province, in 1930 and was rediscovered there in 1960. In three days in 1992, two pairs were found nearby at Londa and Assango; during short visits in 2001, 2002 and 2003, the species was found to be fairly common in Kumbira forest at 800–1000 m on the west flank of Mount Njelo, 7 km south of Conda, and also in degraded farmbush below 800 m with subsistence agriculture. Gabela, Londa, Assango and Kumbira bound an area of only 700 km². In 2005, this bush-shrike was recorded north of Gabela at 735 m and at Gungo at 1030 m. Scarp forests had been selectively logged before civil war broke out, in 1974. In that year a proposal was made to protect an area of 50 km² around Gabela, but it was not implemented; valley bottoms have now been cleared of undergrowth and 20–70% of canopy trees felled for banana, sweet potato, cassava and maize agriculture. Little more is known about the present status of the Gabela forests themselves. The fact that the Gabela Bush-shrike has recently been discovered to inhabit farmbush, as well as intact forest, gives some grounds for optimism about its prospects for survival.



Braun's Bush-shrike (L. brauni) *and the **Gabela Bush-shrike** are both confined to tiny areas of escarpment forest in Angola. Both are Endangered. First discovered in 1930, and rediscovered in 1960 at Gabela, the Gabela Bush-shrike was lost again until the 1990s. The fact that it has recently been found to inhabit farmbush, as well as intact forest, gives grounds for optimism about its survival.*

[*Laniarius amboimensis*, Fazenda Cafendafrica, Seles, Angola. Photo: Fabio Olmos]

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Genus *MALACONOTUS* Swainson, 1824

1. Fiery-breasted Bush-shrike

Malaconotus cruentus

French: Gladiateur ensanglanté **German**: Blutbrustwürger **Spanish**: Gladiador Cruento

Taxonomy. *Vanga cruenta* Lesson, 1831, Cape of Good Hope; error = Cape Coast, Ghana.
Sometimes treated as part of the superspecies formed by *M. blanchoti*, *M. monteiri* and *M. lagdeni*; nominate race of *M. monteiri* has been thought to be a colour morph of present species; largely sympatric with *M. lagdeni*, so best regarded as separate species. Geographical variation not understood: of five races named, based on extent and depth of orange or red suffusion of breast, and on size (slightly decreasing from W to E), only "nominate" (Sierra Leone E to SE Nigeria), *gabonensis* (SW Cameroon and Gabon) and *adolfifriederici* (PRCongo, S Central African Republic, N & E DRCongo and W Uganda) possibly worthy of recognition. Most or all populations, however, exhibit individual variation in amount of yellow/orange/red/scarlet below, and species probably polymorphic, rather than polytypic. Treated as monotypic.
Distribution. Sierra Leone E, discontinuously, to SE Nigeria, SW & S Cameroon, Gabon, N & SW PRCongo, S Central African Republic, N & E DRCongo (S to Itombwe) and W Uganda (Semliki Forest).
Descriptive notes. 23–25·5 cm; male 68–79·5 g, female 70–91 g. A large, powerful bush-shrike with a heavy, hooked bill, a deep indentation in cutting edge behind hook, three nasal and five rictal bristles on each side of bill. Two colour morphs, yellow and red, with some intermediates. Has forehead, lores and surrounds of eye white, crown, nape and ear-coverts grey, sharply demarcated from red, orange or yellow throat, and merging into olive-green on mantle, back, wing, rump and tail; tertials black, broadly tipped yellow, alula and primary coverts blackish; tail rounded, yellow-tipped, with broad black subterminal band; chin, throat and breast variably scarlet, red, orange or yellow; belly and undertail-coverts yellow; in W of range (E to Nigeria) throat and breast mainly yellow (except on Mt Nimba, in N Liberia, where uniform, with small area of pale orange on breast), many in Cameroon (also some in Sierra Leone) have orange-yellow chin, orange-red throat and breast, orange upper belly, brilliant yellow lower belly, flanks, thighs and undertail-coverts, but in Kumba (SW Cameroon) half of population yellow-orange and half red-orange; in Gabon and DRCongo, most have brilliant orange chin and throat, bright red-orange or scarlet breast, and bright yellow belly and undertail-coverts, paler at side; iris pale blue-grey or greyish-white; bill black; legs grey to dark blue-grey. Sexes alike. Juvenile is like adult, but forehead to hindneck and ear-coverts buff-brown, underparts initially fluffy, chin and throat white, breast pale greyish-yellow, belly pale yellow, black band in tail narrow; later, throat orange, black-and-yellow pattern in tertials dull; later still, crown tawny, upperparts uniform dark olivaceous brownish-grey, with white lores or, at least, white spot above each nostril, underparts as for adult but flanks and belly buff-grey. Voice. Song 4–10 short, resonant, hollow-sounding "hoh" notes, like voice of Hairy-breasted Barbet (*Tricholaema hirsuta*), at rate of 10 in 16 seconds, soon repeated. Characteristic call a hard, sharp accelerating trill, "krrrièèèk"; other calls include excited, rolling "rrrourourou", sometimes in flight, also sharp "kik-ik-ik", and harsh rasping and chattering notes. Also clicks bill and makes "fripping" sounds with wings.



Habitat. Lowland forest from sea-level to 1500 m, less commonly to 1900 m (in DRCongo). In Liberia, primary forest along rivers and forests with more open canopy bordering inundation zones, abandoned farms, secondary forest and (on Mt Nimba) ridge forest; in Ghana and Nigeria, undergrowth in secondary forest, forest edges and well-wooded gardens; in Gabon, gallery forest, regen-

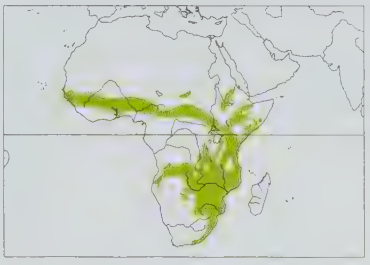
erating woods 3–5 years old in forest clearings, and thick cover in unkempt plantations; in N DRCongo, all strata in closed dry forest and canopy of open forest.
Food and Feeding. Eats beetles (Coleoptera), cicadas (Cicadidae), grasshoppers and crickets (Orthoptera), mantises (Mantidae), butterflies and moths and their larvae, pupae and eggs (Lepidoptera), and small tree-frogs; small seeds found in stomachs; captives accept small vertebrates and pieces of meat. Often in canopy; lower down, likes tangled curtains of creepers and dense undergrowth; often at edges of forest paths, sometimes on ground. Forages by creeping through and searching leafy vegetation, moving rather ponderously; may remain motionless for 10 minutes before moving on; joins mixed-species foraging parties. Holds prey underfoot and uses bill to tear it apart.
Breeding. Few data. In W Africa calls all year (mainly Sept–Apr), breeding apparently Jun–Apr, with oviduct eggs in Jun and Nov in Cameroon, courtship and copulation Oct and dependent young Nov in Liberia, and nest-building Feb in Gabon; in E DRCongo (Itombwe) about Mar–Jul and Oct–Nov; in breeding condition in Jul in Uganda. Thought to be territorial; two or three males at a time sing from high in canopy; four individuals, presumed to be two pairs, seen in apparent territorial display together, with much hooting, upward head-pointing and bill-snapping. Nest-building spells last c. 20 minutes, in early morning, each collecting and building trip taking 1·5–2 minutes; one female brought material found 10–15 m away, drooped and vibrated wings, male approached her and the two moved to nest, where she worked material in; nest a shallow bowl, loosely built of dry vines, small twigs, leaf petioles, grass stems or weed stalks and maize "silk", lined with rootlets, or a platform of large dead twigs and the bowl then lined with vegetable fibres and dead leaves; sited low down in small branches or in tangle of vines, or on fork 4 m up in cocoa tree. Clutch 2–3 eggs; no information on incubation and nestling periods.
Movements. Resident.
Status and Conservation. Not globally threatened. Uncommon in limited ranges in Sierra Leone and Guinea (Ziama Massif), but in Liberia frequent S of 7° N and locally common in N, where common at 800–1500 m on Mt Nimba; in Ivory Coast, common in Danane–Nimba–Taï area and locally frequent in Abidjan–Bouaké–Maroué region; in Ghana, absent from wetter forests in SW but not uncommon elsewhere in forest zone and outliers to N (Chama, Mampong, Amedzofe, Akropong, Tafo); in Togo, recorded only in SW (near Misahöhe); in Nigeria, not uncommon in SW, but elsewhere recorded only in Niger delta (where uncommon) and at Ikom; widespread and frequent to common in Cameroon and Gabon; local in PRCongo (Kouilou Basin, Odzala National Park, rare in Nouabalé-Ndoki National Park); in Central African Republic only in Lobaye Prefecture; in DRCongo, only a few scattered records in N, several old records near Buta, in NE, also local and uncommon in E from Semliki S to Kivu and frequent in Itombwe; in Uganda, confined to Bwamba lowlands at c. 700 m and said to be common in 1960s, but no records since. A shy, skulking species, easily overlooked except when calling; likely to be commoner than it appears, with a less discontinuous range than currently suggested. Adaptable, inhabiting not only mature lowland forest but also thick secondary growth and well-wooded farms and gardens adjacent to forest. In Liberia, seems to be less common in primary forest than in secondary forest (and to forage lower down in latter, where doubtless easier to find); six calling individuals along 2 km of ridge forest on Mt Nimba. Pair has home range of 6–10 ha in closed-canopy forest (Gabon). In Ivory Coast thought to be much less common than formerly, and throughout W Africa its numbers have no doubt diminished greatly with accelerating clearance of forests in recent decades.
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2. Grey-headed Bush-shrike

Malaconotus blanchoti

French: Gladiateur de Blanchot **German**: Graukopfwürger **Spanish**: Gladiador Cabecigrís

Taxonomy. *Malaconotus blanchoti* Stephens, 1826, Senegal.
Forms a superspecies with *M. monteiri* and *M. lagdeni*, with *M. cruentus* sometimes included in same group; has been regarded as conspecific with *M. monteiri*. All races intergrade at common boundaries; size decreases clinally from N to S. Seven subspecies recognized.
Subspecies and Distribution.
M. b. blanchoti Stephens, 1826 – Senegal E to N Cameroon.
M. b. catharoxanthus Neumann, 1899 – N Cameroon E to Ethiopia (N and W of Rift Valley), Eritrea, Uganda and W Kenya.
M. b. approximans (Cabanis, 1869) – Ethiopia (S and E of Rift Valley), Somalia, Kenya and N Tanzania.
M. b. interpositus E. J. O. Hartert, 1911 – Angola, SE DRCongo (Katanga) and N & W Zambia (Mporokoso; North-Western Province).
M. b. citrinipectus Meise, 1968 – SW Angola and extreme N Namibia (Cunene valley and N Ovamboland).
M. b. hypopyrrhus Hartlaub, 1844 – from Rwanda, Tanzania and C & S Zambia S to NE Namibia (Caprivi Strip), N & E Botswana, Zimbabwe, S Mozambique and E South Africa (near Durban).
M. b. extremus Clancey, 1957 – coastal South Africa from S of Durban S to St Francis Bay.
Descriptive notes. 23–26 cm; male 73–84 g, female 65–99 g. A large bush-shrike with robust, strongly hooked bill, upper-mandible notch blunter than in large forest-dwelling congeners; two nasal bristles and four rictal bristles on each side of bill. Nominate race has line from nostril to eye white or whitish, chin and throat brilliant cadmium-yellow; otherwise, head and mantle to tail olive-green, tail narrowly tipped pale yellow (up to 3 mm deep on outer two feathers); small outer primary wholly blackish, other remiges blackish, outer vanes olive-green proximal to point of emargination and edged yellow distal to it, secondaries narrowly tipped pale yellow, tertials tipped pale yellow (forming series of spots up to 6 mm long); upperwing-coverts olive-green, greater coverts and outer median coverts broadly tipped pale yellow in triangular or axe-head shape; breast brownish-orange, more so at side (amount and depth of orange varying considerably), belly brilliant yellow, thighs olive-green and yellow, vent and undertail-coverts yellow; underside of tail greyish-olive, tip pale yellow, shafts yellow; underside of remiges pale silvery grey, inner vanes of all except outermost primaries edged pale yellow, underwing-coverts and axillaries sulphur-yellow, leading edge of wing bright yellow; iris orange or light yellow (perhaps varying geographically); bill black or black-brown; legs bluish-grey. Sexes alike. Juvenile is like adult, but mottled brown on head, paler yellow on underparts, bill light grey, iris yellow (in areas where adult iris orange) or pale yellow (where adult yellow).



Races vary in colour of underparts (bright yellow to brownish-orange) and in size: *catharoxanthus* is like nominate, but underparts generally uniform bright yellow, side of breast sometimes with brown wash; *approximans* has tawny-orange on underparts deeper in shade and more extensive, forming gorget enclosing yellow throat and extending well on to flanks; *interpositus* has breast with less brown-orange suffusion; *citrinipectus* has fore throat and breast lemon-yellow (not cadmium-yellow); *hypopyrrhus* is very like nominate, but wing and leg slightly shorter; *extremus* has top of head, nape and hindneck darker grey (less bluish) than nominate, upperparts and wing and tail darker green (less yellowish). Voice. Male song or advertising call a series of spooky, drawn-out whistles on one pitch, "uuuuuuuuh", "whoooooooo" or "hawwwwww", mournful, ventriloquial, slightly quavering, whistle starts softly, becomes louder and stops abruptly, is repeated up to 50 times at intervals of 1–5 seconds, and often given by two birds in antiphonal duet; some notes shorter, with falsetto ending, "whoooo-up" or "hawwwww-ip", or grating and ringing, "wraaaaaaanh", or thinner and squeakier, "wheeu"; whistle may be preceded by soft notes (audible only at close range), and whistles sometimes accompanied by clicking; series may have distinct break in middle, the second set being of higher-pitched "pheeeeeeu" notes. Female occasionally duets with 4–5 harsh drawn-out "skeeeeer" or "skwaaar" rasps. Alarm a loud, explosive "squok-squok" or "squok-tot-squok-tot" (can be given in dive-bombing flight); contact call a soft, plaintive, querulous mewing, "phouu-phouu"; female solicits with quivering wings and soft, buzzing "zzhoreer-zzhoreer" call. Makes "fripping" sounds with wings, and threatens with loud bill-snaps followed by short, soft "klip-klip-phoou".
Habitat. Thick woody growth and bushes in open savanna woodland, keeping to tangled growth, creepers, branch masses and dense foliage within a few metres of ground, including canopy of small trees: microphyllous, thorny woodland, shrubby pasture, dense riparian woods, riverine forest and thickets. In NW Nigeria inhabits old woodland, dry or wet, with very thick undergrowth and dominant trees African mahogany (*Khaya senegalensis*) and kapok (*Ceiba pentandra*) and palms *Borassus*, *Raphia* and *Elaeis*. In Ethiopia lives in woods at 180–1800 m; in Eritrea in riverine woods, especially with tamarinds (*Tamarindus indicus*), and mixed woods below 1210 m. In NE DRCongo occurs in plantations of Ceará rubber (*Manihot glaziovii*), and in Rwanda in galleries of *Acacia polyacantha*; resident in eucalypt (*Eucalyptus*) plantations in Swaziland and occurs near neem (*Azadirachta*) in Nigeria, but generally rare in exotic vegetation. In Zimbabwe typically in brachystegia (*Brachystegia*) woodland, commonest in riparian fringing forest with tall acacia trees, sometimes within lowland evergreen forest; uncommon in semi-arid savannas. In Somalia has predilection for acacias but lives in all types of woodland, including fragmented forest, riverine woods and scattered trees. Everywhere can occur in large gardens and parks, and sometimes nests close to houses.
Food and Feeding. Large arthropods and small vertebrates: locusts and grasshoppers (Acrididae), mantises (Mantidae), bees and wasps (Hymenoptera), particularly eumenid mason wasps, beetles (Coleoptera), termites (Isoptera), dragonflies (Odonata), caterpillars and moths (Lepidoptera) and worms (Annelida); small chameleons (Chamaeleonidae), geckos (Gekkonidae) and other lizards, snakes up to 60–70 cm long, frogs, rodents, bats, also birds and their eggs and nestlings. Forages at all levels in vegetation c. 12 m tall, up to canopy; hops and bounds nimbly, in crouched posture, along and between branches and through twigs, diligently checking leaves for insects, peering about and even twisting head upside-down; may pay more attention to branches than to leaves when foraging; tends to work its way upwards in a tree. Sometimes forages in leafless shrubs, and descends to ground to take worms or swarming termites; also hawks insects in flight, fluttering up to catch one with audible snap of bill. Often raids bird nests; attempts to catch a small bird by pursuing it through vegetation. Appears to kill and dismember prey at favourite or special places, from where it takes prey to mate on nest; one consumed a Yellow-fronted Canary (*Serinus mozambicus*) by wedging it firmly between two upright twigs in a mopane tree (*Colophospermum*) and tugging with the bill until a piece came away, the pieces being swallowed instantly regardless of size; when remains of canary came adrift and fell to ground, the bush-shrike dived after and retrieved it. One individual wedged large pupa into broken end of branch, tore it open by using hook at tip of bill, and ate bits of it piecemeal; another wedged items including caterpillars, small frogs and small nestling birds. Small prey items can be held under one foot while being torn apart. A gecko was beaten against a branch to kill it, then eaten piecemeal; seen to kill large moth by pulling its wings off and beating it against a branch or the ground, before swallowing it whole; one individual killed a single-striped grass mouse (*Lemniscomys rosalia*) the same weight as itself (75 g) and carried it for 11 m; one hopped purposefully into a house, flew up to a cluster of mason wasps on ceiling and ate them all, then flew to another cluster outside and quickly consumed them, too. One individual gave up harassing a large flap-necked chameleon (*Chamaeleo dilepis*) c. 30 cm long. Sometimes caches food item. Joins mixed-species foraging flocks in S African winter, although sometimes is mobbed by small birds.
Breeding. Breeds mainly in Jun–Jul in Gambia, Jan–May in Ghana, Feb–Sept in Nigeria; Mar–Jun in Sudan, Ethiopia (once in Dec) and Horn of Africa, and Jul–Dec in E Africa; Sept–Oct at Lubumbashi, in DRCongo; Aug–Sept in Angola, Aug–Feb (mainly Sept–Oct) in Zambia, Sept–May (mainly Oct–Nov) in Malawi, Sept–Jul (mainly Sept–Nov, especially Oct) in Zimbabwe, and Aug–Jan in South Africa; single-brooded. Monogamous. Territorial; singing male holds body sleeked and inclined, tail hanging vertically down, and head bowing downwards with each call; in low-intensity alarm or threat, bird adopts hunched, crouched posture with back feathers raised, calls, opens bill and sways head menacingly from side to side. Courtship involves conspicuous chasing of one partner by the other; in display-flight, male frips wings and fans tail between short glides when it utters whistle call. Nest (or, at least, lining) built by both sexes, male may collect twigs and pass them to female; a shallow, loosely knit, rather untidy, circular platform or bowl 15–17 cm wide, made of twigs up to 5 mm in diameter and 25 cm long, lined with tendrils, dry leaves, bits of soft or strong grass and fibrous roots, placed usually c. 4 m up near top of small deciduous tree with

On following pages: 3. Monteiro's Bush-shrike (*Malaconotus monteiri*); 4. Lagden's Bush-shrike (*Malaconotus lagdeni*); 5. Green-breasted Bush-shrike (*Malaconotus gladiator*); 6. Uluguru Bush-shrike (*Malaconotus alius*).

spreading branches, e.g. *Cassia abbrevita*, fig (*Ficus*), *Strychnos spinosa* or *Parinarium mobola*, either out on side branch or in fork in upright stem, but always where many spreading twigs to support and screen it; often in clump of mistletoe (*Loranthus*); sometimes old nest of dove (Columbidae), sparrowhawk (*Accipiter*) or Grey Go-away-bird (*Corythaixoides concolor*) used; once destroyed nest of African Thrush (*Turdus pelios*), taking material presumably for its own nest; territory c. 50 ha, occupied probably throughout year. Clutch 2–4 eggs, usually 3; incubation by female, sitting very tight, fed on nest by male, period 15–17 days; nestling period c. 20–21 days. In clutches of 4 eggs no more than three seem ever to hatch; three young at 14 days or two at 20 days can be far too big for nest, and one or two may fall from it and die, although often three young do fledge successsfully.

Movements. Probably mainly sedentary, but in Mali moves N with the rains; arrives Bamako in Mar and departs Oct, arrives Ban Markala May and departs Oct. The most N records in Nigeria tend to be in rains; present in W National Park, in SW Niger, only in Oct–May; occurs on Ghana coast only in dry season. Suggestion of movements in Uganda and in S Africa, but clearer evidence required.

Status and Conservation. Not globally threatened. Uncommon to fairly common in savanna woodland throughout sub-Saharan Africa except for the Horn, Congo Basin and the SW. Density in N South Africa (former Transvaal) less than 1 pair/200 ha. In South Africa appears to be commonest in medium-density woodland and less common in dense woods or open savanna. In Nigeria sometimes killed for the traditional-medicine (fetish) market.

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3. Monteiro's Bush-shrike

Malaconotus monteiri

French: Gladiateur de Monteiro **German**: Monteirowürger **Spanish**: Gladiador de Monteiro

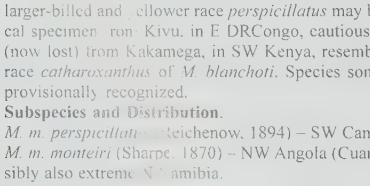
Taxonomy. *Laniarius monteiri* Sharpe, 1870, Dande River, Luanda, Angola.

Forms a superspecies with *M. blanchoti* and *M. lagdeni*, with *M. cruentus* sometimes included in same group; has been regarded as conspecific with *M. blanchoti*, and nominate race has been considered to be a colour morph of *M. cruentus*. Barely known in Cameroon, where supposedly larger-billed and yellower race *perspicillatus* may be only a colour morph of *M. gladiator*; historical specimen from Kivu, in E DRCongo, cautiously attributed to *perspicillatus*; single specimen (now lost) from Kakamega, in SW Kenya, resembled both nominate race of present species and race *catharoxanthus* of *M. blanchoti*. Species sometimes treated as monotypic. Two subspecies provisionally recognized.

Subspecies and Distribution.

M. m. perspicillatus Reichenow, 1894 – SW Cameroon (Mt Cameroon).

M. m. monteiri (Sharpe, 1870) – NW Angola (Cuanza Norte, Cuanza Sul, possibly Huambo); possibly also extreme N Namibia.



Descriptive notes. 25–26·5 cm. A large bush-shrike with a very heavy, hooked bill. Nominate race has lores and small but distinct area around eye white, the white sometimes extending backwards as well-delineated superciliary stripe and with shorter, upcurving subocular stripe; head dark grey, merging into olive on mantle and sharply delineated from bright lemon-yellow throat; rest of upperparts, including tail, bright olive-green, uppertail-coverts with narrow yellow tips, rectrices tipped pale yellow; upperwing olive-green, tertials, greater coverts and most median coverts broadly tipped pale yellow; underparts brilliant yellow, breast more or less suffused with tawny-orange, flanks olive-green (largely concealed beneath spreading yellow belly feathers); underside of remiges shiny dark grey with broad pale yellow inner edges and bases, underside of tail olive-grey; iris greenish-ochre or bluish-grey; bill black; legs slate-blue. Differs from very similar *M. blanchoti* mainly in having eyes dark grey (not yellow), pale face patch more extensive. Sexes alike. Juvenile undescribed. Race *perspicillatus* very poorly known, type specimen has heavier bill and is paler yellow below than nominate, the breast without orange wash. Voice. Call of one individual duetting with *M. gladiator* was a mournful whistle of 5 notes without inflections at end, repeated five times; probably indistinguishable from voices of *M. gladiator* and *M. blanchoti*. Makes "klip-klip" snapping or rattling with bill.

Habitat. In Angola, inhabits montane and submontane riverine, gallery and coffee forests and secondary scrub along the escarpment, and may extend into lowland forest; lusher lower seaward slopes (of Mt Njelo, S of Gabela, in Cuanza Sul) where forest merges with abandoned and regenerating shade coffee plantations; degraded secondary forest, old coffee plantations and primary forest at Kumbira Primero, near Conda (Cuanza Sul). In Cameroon, found in primary montane forest at 1000–1450 m.

Food and Feeding. No information.

Breeding. No information.

Movements. Presumably sedentary.

Status and Conservation. Data-deficient. Restricted-range species: present in Cameroon Mountains EBA and Western Angola EBA. Very poorly known species; elusive and formerly thought to be very rare. In Angola, six or seven historical specimens and a few sight records up to 1957, from R Dande near Luanda, Dondo, Mucoso, N'dalatando, Gabela, Quipeio, "Bucaso" (perhaps Buçaco), Quitondo and Canjala (12° S); in 2001–2003 and 2005, in Cuanza Sul, found to be locally surprisingly common in Kumbira Forest, on Mt Njelo (near Conda), where several heard while calling simultaneously and one photographed, in near-pristine forest and degraded secondary scrub, and in 2005 reported as widespread, if uncommon, from R Dande S to Assango, Tondo and Gungo (11°50' S). In Namibia, an individual thought to be of nominate race of present species was collected at Okombambi (R Cunene valley) in 1963. In Cameroon, no records on well-worked Mt Cameroon since 1894, when type specimen of race *perspicillatus* collected (in Buea); individual with characters of present species seen in 1992 in same tree as *M. gladiator* on Mt Kupé, where one was glimpsed in 1997 on Max's Trail; one or two seen at 1250 m at L Edib, in Bakossi Mts, in 1997. Specimen, now lost, said to have been obtained in Kakamega Forest, in SW Kenya, in 1932; individual attributed to this species obtained at Kanzenze, in E DRCongo, in 1905. Widespread destruction of forest in Angola has doubtless compromised the survival prospects of this bush-shrike, which seems always to have been thinly distributed.

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4. Lagden's Bush-shrike

Malaconotus lagdeni

French: Gladiateur de Lagden **German**: Lagdenwürger **Spanish**: Gladiador de Lagden

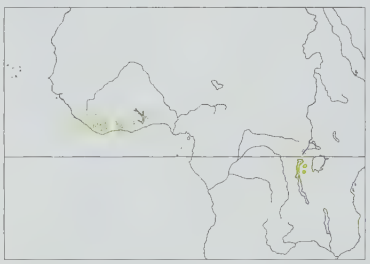
Taxonomy. *Laniarius lagdeni* Sharpe, 1884, "Ashantee" (Kumasi), south Ghana.

Forms a superspecies with *M. blanchoti* and *M. monteiri*, with *M. cruentus* sometimes included in same group; voice suggests that it is closest to *M. cruentus*, with which it overlaps in range. Two subspecies recognized.

Subspecies and Distribution.

M. l. lagdeni (Sharpe, 1884) – SE Sierra Leone E to Ghana, possibly to Togo.

M. l. centralis Neumann, 1920 – E DRCongo, W Uganda and W Rwanda.



Descriptive notes. 24·5–25·5 cm; male 84–97 g. Nominate race has forehead to hindneck and side of neck uniformly dark grey, mantle to tail bright olive-green, tail rounded, outer three rectrices tipped bright yellow; upperwing with black flight-feathers, olive on outer webs, upperwing-coverts black, broadly tipped bright yellow, tertials olive-green with yellow tips and wide subterminal black band; brilliant yellow below, throat and upper breast strongly suffused with orange, paling to yellow on lower breast, flanks olive-green (largely concealed beneath spreading yellow belly feathers); underwing-coverts and axillaries bright yellow, underside of flight-feathers shiny dark grey with pale yellow inner edges; iris bluish-grey; bill black, two nasal and four rictal bristles on each side; legs slate-blue. Sexes alike. Juvenile has forehead and cheek to upperparts, including wings and tail, dark greyish-brown, tertials narrowly tipped grey and with blackish subterminal band, chin and throat white, breast white with greyish tinge, centre faintly dappled, sides greyer, upper belly white in middle, grey at side, lower belly, thighs and undertail-coverts warm buff; bill pale grey-brown or horn at first, later becoming blackish. Race *centralis* is very like nominate, but usually has much less orange on throat and upper breast. Voice. A mournful, quavering, drawn-out "whoooooo" or "uuuuuuuh", 0·5–0·7 seconds long, sometimes falsetto at end and disyllabic, "whoooo-up", repeated up to 14 times at intervals of 3–5 seconds; also low, soft "hoh", usually repeated four times at one-second intervals, lower than similar call of *M. cruentus*; pair may call in duet, female's "hoh" synchronous with male's "whoooooo"; also, a more melodious whistle, "heejwoo, heeet-huuuu", mournful "hoop, hooooo" (second note longer and lower), quavering "wip, haww", grating raucous "chaarr-chaarr" and "chrrr", and loud staccato "kkk-k-k-kkk". In E Ghana gives 4–5 soft whistles at rate of one per second, each rising slightly in pitch; in Ivory Coast calls include a whistle like that of African Golden Oriole (*Oriolus auratus*); in Sierra Leone repertoire much more complex, with long whistles and broken whistles; in Rwanda calls just like those of *M. blanchoti*. Reacts readily to voice playback and to human imitations, by falling silent for some minutes, giving rattles, and then singing repeatedly. Makes loud flapping noises with wings when agitated, and may snap bill.

Habitat. Dense creepers in evergreen rainforest, in W Africa at 100–700 m and in E of range at 1400–3300 m (mainly 1900–2700 m); commonest at height of 10–30 m in undisturbed forest, also in lightly logged and even much-disturbed forests. Found also in gallery forest, secondary growth near forest edges and clearings, and open grassy woods at high elevations.

Food and Feeding. Insects, including katydids (Tettigoniidae); also small vertebrates, including a frog, a 10-cm-long *Agama* lizard, and a Blue-throated Brown Sunbird (*Cyanomitra cyanolaema*). Forages in middle strata and in open parts of canopy, mainly at 10–30 m. Main method is gleaning of branches 5–30 mm thick; beats large insects vigorously against perch. Predatory, and small birds warn of its approach, but commonly found in mixed-species foraging flocks of insectivorous birds and often in company of *Chlorophoneus multicolor*.

Breeding. Various evidence indicates approximate seasons Jun–Jul in Liberia, Oct–Jan in Ivory Coast, Dec to at least Feb in DRCongo, and Mar in Uganda; in W Africa, sings in Jan and Feb (although one sang only twice in 5 days) and silent in Jul. Nest built by both sexes, once approaching it while carrying long, very thin fibres and singing in duet as they did so; only one nest examined, a bulky bowl of dry leaves and bracken placed 3·5 m up in fork of small tree in dense secondary growth in abandoned clearing; two uninspected nests were hidden in leafy regrowth on top of broken-off tree c. 6 m tall. Single clutch known was of 2 eggs; in Liberia, two fledglings were guided each by one adult for c. 35 days. No other information.

Movements. Appears to be entirely sedentary.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. In Sierra Leone, uncommon in Gola Forest, formerly probably more widespread. In Liberia, widely distributed but uncommon, known from c. 16 lowland high-forest locations; population estimated to be c. 6000 pairs, with densities locally of 1–3 pairs/2 km². In Ivory Coast, known only from Taï, Mopri

and Yapo Forests. Single old record in Ghana, but possibly occurs in Nini-Suhien National Park and, in SE, recently found in Kyabobo forests, on Togo border; possible presence in Togo suggested by a sight record by Pagala–Ghana road in 1990. In DRCongo, uncommon in Ruwenzoris, Kivu Volcanoes at c. 2400 m (Kibumba, Bitashimwa, Kamatembe, Mt Karisimbi), and S to Itombwe highlands (where uncommon) at 1390–2710 m (Kiliza, Kitongo, Luiko, L Lungwe, Mayamoto, Mianga and Mikenge). In Uganda, scarce at 2200–2700 m in Ruwenzoris and Virunga Volcanoes, but may be locally quite common in Bwindi-Impenetrable Forest. In Rwanda, uncommon in Gishwati Forest; rare in wetter Nyungwe Forest, where only two records in five months, at Uwinka at 2500 m and S of it at 2300 m; recorded also near Mt Bigugu. Poorly known over much of range; elusive, and may therefore be commoner than the sparse data suggest. On the other hand, continuing destruction of forest habitats is bound to affect the species adversely, even though it may have moderately wide habitat tolerance.

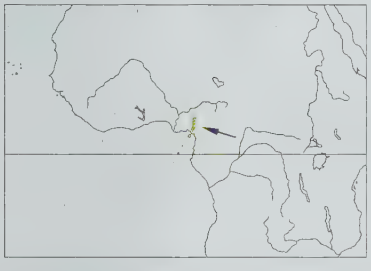
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5. Green-breasted Bush-shrike

Malaconotus gladiator

French: Gladiateur à poitrine verte **German**: Grünbrustwürger **Spanish**: Gladiador Pechiverde
Other common names: Cameroon Mountain/Gladiator/Cameroon Bush-shrike

Taxonomy. *Laniarius gladiator* Reichenow, 1892, Buea, Mount Cameroon, Cameroon.
Closely related to *M. cruentus* and the superspecies formed by *M. blanchoti*, *M. monteiri* and *M. lagdeni*. It has been argued that present taxon, restricted to W Cameroon and extreme SE Nigeria, is no more than a colour morph of *M. monteiri*, an Angolan near-endemic of questionable occurrence in W Cameroon, and, conversely, that a specimen and two sightings of *M. monteiri* from Mt Cameroon and Mt Kupé relate to colour varieties of present species. Monotypic.
Distribution. SE Nigeria (Obudu Plateau and Cross River National Park) and W Cameroon (Bamenda-Banso Highlands, Bakossi Mts, Mt Kupé, Mt Nlonako, Rumpi Hills, Dikume Balue, and Mt Cameroon above Bonenza and Buea).



Descriptive notes. 25–28 cm; 99 g. A large, green bush-shrike with powerful, deep, hook-tipped bill. All of head down to hindneck, side of neck and malar area rather dark grey; rest of plumage mostly olive-green, underparts slightly brighter than upperparts; primaries blackish, narrowly edged olive; alula feathers, primary coverts, greater coverts, tertials, secondaries and inner primaries narrowly tipped yellowish-olive; iris light grey or greyish-white; bill black; legs grey or blue-grey. Sexes alike. Juvenile undescribed. VOICE. Song, audible for at least 1 km, of 3–10 drawn-out, mournful, ventriloquial, low-pitched whistles, each 1–1·5 seconds long, at rate of 1 whistle every 1·5–2 seconds; sometimes whistles end with a falsetto note, and may be shorter and given at faster rate; whistle-song of four types, (1) 5–10 whistles on one pitch, (2) shorter series at same pitch, each whistle ending with upward inflection, "hooooooooo-lwe", (3) combination of preceding two types, and (4) undulating series of whistles at slightly different pitches; in Bamenda Highlands said to have thinner, more muffled whistle than that heard farther S. Call a harsh rasping, at same length and rate as the whistles; one call, thought to be by female, is of up to 5 raucous, tearing "haaarrrr" notes that may be given in duet with (male's) whistles; also, a harsh "chit-chipaa", buzzy "tziktzu" sounds, unmusical chattering, and loud bill-snapping or bill-rattling. Voice very like those of *M. monteiri* and *M. blanchoti*; whistles perhaps slightly longer and "haaarrrr" lower-pitched than in *M. monteiri*. Can readily be attracted close by voice playback or by imitation of whistle, when it becomes agitated and can respond by drumming with bill on branch or may glide into another tall tree and then call.
Habitat. Wet, gloomy primary and secondary montane evergreen forests, often on steep, dissected terrain, at 950–2300 m; also in tree-fern groves, thick second-growth forest canopy along mountain streams, and forest underplanted with subsistence crops. Mainly in high canopy, sometimes down to 10 m or even 2 m above ground; in Bakossi Mts strictly confined to canopy, although readily brought to edges of clearings by voice playback.
Food and Feeding. Insects, including large green locusts (Acrididae), apparently hunted in canopy by gleaning. Occurs singly and in pairs.
Breeding. Gonads slightly hypertrophied in Dec. No other information.
Movements. Resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in Cameroon Mountains EBA. Rare in most of small global range. Fairly common at 1100–1400 m in Bakossi Mts, where at least six territorial birds or pairs found in Apr 1998 in less than 1 km² of forest–grassland mosaic near Kodmin, also common near L Edib, on nearby Mt Kupé at 1100–1950 m and Mt Nlonako at 1400–1600 m. Elsewhere in W Cameroon, recorded S to Rumpi Hills (1300 m, and Dikume Balue at 1520 m) and Mt Cameroon (S slopes above Bonenza at 950–1350 m, and above Buea at 1375–1800 m), and N to Bamenda-Banso Highlands (near Bambulue at 2080 m, Bali-Ngemba Forest Reserve at 1700 m, forest patches between Mbengwi and Tinachong, and Mt Oku at 2200–2300 m). Bali-Ngemba population thought to be healthy; rare in Kilum-Ijim forests at c. 2250 m on Mt Oku, where conservation projects have proceeded for 20 years, but species recorded only in 1984 and 1998. Among the bird species of greatest conservation concern, for which BirdLife International's Kilum-Ijim Forest Projects and, in 1991, Mount Kupé Forest Project were initiated. Mid-altitude forests are largely degraded by logging, firewood collection, and clearance for agriculture and grazing. Loss of forest on Mt Oku and on Obudu Plateau continues at a great rate, although a small patch of Obudu forest has been protected.

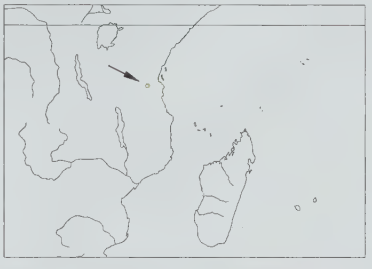
Bibliography. Anon. (2008d), Bannerman (1939a), Bowden (2001), Bowden & Andrews (1994), Bowden & Bowden (1993), Butchart & Stattersfield (2004), Collar & Stuart (1985), Collar *et al.* (1994), Demey (1997, 2005), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire & Dowsett (1989, 1998b), Elgood *et al.* (1994), Fishpool & Evans (2001), Fry *et al.* (2000), Fuchs *et al.* (2005), Hall & Moreau (1970), Hall *et al.* (1966), Harris & Franklin (2000), Louette (1981), Mackworth-Praed & Grant (1973), Maisels & Forbosch (1999), Prigogine (1984b), Serle (1950, 1954), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Stattersfield & Capper (2000), Stuart (1986), White (1962), Williams (1998).

6. Uluguru Bush-shrike

Malaconotus alius

French: Gladiateur des Uluguru **Spanish**: Gladiador de las Uluguru
German: Schwarzkappenwürger
Other common names: Blackcap/Black-capped Bush-shrike

Taxonomy. *Malaconotus alius* Friedmann, 1927, Bagilo, Uluguru Mountains, Tanzania.
Differs from congeners in slightly smaller size, black head, brown eye, degree of sexual disparity, and perhaps also voice, and was thought by some possibly to be related to Malagasy vanga family (Vangidae), rather than to current family. Recent studies of nuclear and mitochondrial DNA, however, strongly support its placement within present genus. Monotypic.
Distribution. Uluguru Mts, in E Tanzania.



Descriptive notes. 23–24 cm. Medium-large bush-shrike with huge, powerful, hook-tipped bill. Male has forehead to nape, hindneck and side of neck glossy black, sharply defined all around; upperparts, including wing and tail, uniformly olive-green, concealed parts of remiges blackish; chin and throat bright yellow, breast yellow with green tinge and belly yellow in mid-line, both merging to olive-green at sides, and flanks and thighs olive-green, vent and undertail-coverts greenish-yellow (some individuals have underparts below breast entirely green); axillaries, underwing-coverts and underside of remiges bright yellow, underside of tail olivaceous grey; iris reddish-brown; bill black; legs bluish-grey. Female is like male, but underparts duller and greener. Juvenile undescribed; one identified as such in the field differed from adults in being duller, with crown greyer. VOICE. Distinctive, strident, far-carrying series of low-pitched disyllabic whistles, "huw-teew" or "wu-chiew", second note higher and downslurred; also a series of rhythmic multisyllables, "kokok-teew", "wokwok-teew-teew", "ku-ku-kua-kua"or "chi toktokchii,toktok-chii...". Calls of one individual may be answered by another. Responds to playback of voice.
Habitat. Densest foliage in canopy of submontane and montane forest, from 1300 m to 2100 m.
Food and Feeding. No information.
Breeding. Immature seen in Jul. No other information.
Movements. Presumed sedentary.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Tanzania–Malawi Mountains EBA. Confined to forest on Uluguru Mts, where elusive and rare. N Uluguru is a narrow ridge 25 km long, the highest peak at 2360 m, with Mt Lupanga at N end rising to 2138 m and only 2 km from town of Morogoro; S Uluguru, also 25 km long but up to 17 km wide, is largely an 1800-m plateau, rising to 2668 m (Mt Kimhandu). Forest cover was c. 300 km² in 1955; by 1980s luxuriant humid evergreen submontane forest at 800–1500 m had been largely cleared for cultivation; submontane forest, with canopy height of 30–50 m, gradually gives way to damper montane forest, with canopy height of 10–30 m, between 1500 m and 1850 m, above which the N ridge and S plateau are clothed in wet moss forest. Forest areas had been reduced to c. 220 km² in 2000; remaining forest now nominally protected in two reserves, Uluguru North and Uluguru South Forest Reserves, formerly adjoining but now separated by 1·5 km of farmland. This species is found mostly in N Uluguru, where encountered in 1981 and 1982 at 1300 m on Mt Lupanga and, particularly, 7 km to S at c. 1800 m near Bagilo. During two months of fieldwork in 1993, three or four territories were found on E slopes of N Uluguru and total population estimated at 1000 pairs. In detailed survey in 1999–2000 several birds found in Uluguru North Forest Reserve, an area of 83·6 km², which was estimated to hold c. 1200 pairs, mainly at 1200–1700 m. In what is presently mainly farmland, one individual of this species was seen in 1948 at Bunduki (1500 m), now a tiny and badly damaged forest reserve between N & S Uluguru. In S Uluguru, one individual found in 1981 at 2100 m. The 1999–2000 survey failed to encounter any in Uluguru South Reserve, then 164·3 km² in extent, but in 2007 a pair was located by call playback at 1739 m, near Bunduki (and only 3·4 km from nearest record in N Uluguru), and on same day another was found 400 m from the pair, at 1885 m. One member of the pair was seen a month later. Lower slopes of Ulugurus have been heavily exploited by the dense local human population; submontane forest has been subject to greatest destruction, a trend continuing up to at least 2000. A three-year conservation action plan was initiated in 1999 by RSPB and EU, in collaboration with local organizations and communities. While lower forests continue to be modified by underplanting with banana and other cash crops, the resilience of this bush-shrike's congeners to forest habitat modification suggests that it may yet sustain itself.

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PLATE 2
inches 4
cm 10
ssp ussheri
ssp souzae
ssp australis
7
8
9
ssp senegalus
ssp percivali
ssp remigialis
10
ssp minutus
11
ssp reichenowi
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13
14
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ssp gambensis
ssp hamatus
15
ssp cubla
ssp erythreae
17
ssp affinis

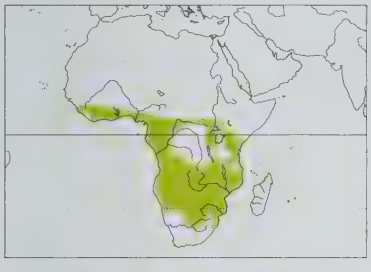
Genus *TCHAGRA* Lesson, 1831

7. Brown-crowned Tchagra

Tchagra australis

French: Tchagra à tête brune **German**: Dorntschagra **Spanish**: Chagra Coroniparda
Other common names: Three-streaked Tchagra(!), Brown-headed Tchagra/Bush-shrike; Souza's Tchagra (*souzae*)

Taxonomy. *Malaconotus australis* A. Smith, 1836, north of Kurrichane, northern South Africa.
Forms a superspecies with *T. jamesi* and *T. tchagra*; has hybridized with former. Additional named races are *littoralis* (described from Changamwe, in Kenya) and *congener* (Neu-Helgoland, Songea, S Tanzania), both synonymized with *minor*, and *frater* (Bangwa Mts, W Cameroon), subsumed in *emini*. Nine subspecies recognized.
Subspecies and Distribution.
T. a. ussheri (Sharpe, 1882) – Sierra Leone E to SW & S Nigeria.
T. a. emini (Reichenow, 1893) – SE Nigeria S to lower R Congo, E to N & E DRCongo, S Sudan, Uganda, W & C Kenya, Rwanda and NW Tanzania.
T. a. souzae (Bocage, 1892) – SW PRCongo S to C Angolan plateau (S to N Huíla), E to S DRCongo (to upper Katanga) and N Zambia (near Ndola).
T. a. ansorgei (Neumann, 1909) – W Angola (S Cuanza Norte and Luanda S along coast and escarpment to C & S Huíla and E Namibe).
T. a. bocagei da Rosa Pinto, 1968 – SE Angola (C Cuando Cubango).
T. a. minor (Reichenow, 1887) – SE Kenya, Tanzania (except NW), Zambia (except Ndola and extreme SW), Malawi, N Zimbabwe and N & C Mozambique (S to R Save).
T. a. rhodesiensis (Roberts, 1932) – SE Angola (Cuando Cubango), NE Namibia (along R Okavango E to Caprivi) and NW Botswana.
T. a. damarensis (Reichenow, 1915) – extreme SW Angola, Namibia (except NE), Botswana (except NW), SW Zimbabwe (W & NW Matabeleland) and N South Africa (S to N Northern Cape and W Free State).
T. a. australis (A. Smith, 1836) – SE Zimbabwe (in Sabi valley and SE lowveld), NE South Africa (S to N KwaZulu-Natal), S Mozambique (Sul do Save) and E Swaziland.



Descriptive notes. 17·5–20 cm; male 35–40 g and female 31–44 g (*emini*), male 30–46 g and female 30–33 g (*ussheri*), male 30–33 g and female 27·5–34 g (*minor*). Nominate race has forehead to nape brown, narrow black lateral crownstripe extending back and broadening along side of nape, long pale buff superciliary stripe bordered below by black stripe through lores and behind eye; hindneck, mantle and inner scapulars brown, outer scapulars rufous with blackish-brown feather centres, rump and uppertail-coverts greyish-brown; central tail feathers olive-brown with narrow, evenly spaced, dark greyish bars, other tail feathers black with white tip, white 1–2 mm deep on T2, increasing to c. 11 mm on inner web of outermost rectrix (T6), on which white also extends back along outer web as long narrow wedge; remiges blackish-brown, outer webs of primaries rufous, outer webs of secondaries rufous at base and edges, tertials broadly edged rufous, alula dark brown, outer web of largest feather edged white; median and lesser upperwing-coverts rufous-chestnut, coverts at bend of wing white; ear-coverts and side of neck light brown, cheek greyish-buff; below, dull buff, chin and throat paler, breast and flanks darker grey; axillaries and underwing-coverts buff, large cinnamon-buff area on underside of flight-feathers (formed by pale inner borders); iris purplish-brown with pale inner rim, lower eyelid featherlets white; bill black; legs slate-grey or blue-grey. Distinguished from very similar *T. tchagra* mainly by smaller size and shorter and less robust bill (bill 21 mm long, as against 31 mm); from *T. jamesi* by larger size, different head pattern and somewhat darker plumage. Sexes alike. Juvenile and immature are like adult, but head pattern less distinct, plumage more grey-buff below, throat and breast faintly mottled, tail feathers tipped pale buff, bill horn-brown, eyes greyish dark brown. Races vary relatively little, mainly in size and in coloration of underparts and, to lesser extent, of upperparts: *rhodesiensis* is somewhat paler above and more tawny-buff below than nominate; *damarensis* is paler and greyer above than previous, paler tawny-buff below, with little grey on breast and sides, also slightly larger; *emini* is warmer brown above, with hindneck, mantle and inner scapulars tawny-brown, much paler below, underparts greyish-white with buff tinge, breast and flanks darker grey with brown tinge, undertail-coverts pale buff; *ussheri* is similar to previous, but slightly paler brown, less tawny, above and clearer grey, less buffy, below, also slightly smaller (on average c. 3 g lighter); *minor* also is similar, but slightly paler brown above and whiter below, with less grey on breast and sides, also smaller (on average 5–6 g lighter); *souzae* is richer brown above and darker grey below, differs from all other races in having brown centres of inner scapulars and tertials merging with rufous edges; *ansorgei* is like *emini* above but deep tawny-buff below; *bocagei* resembles last, but upperparts darker. Voice. Territorial song generally given in flight, preceded or accompanied by loud wing-fripping. In W Africa male's song a jaunty series of liquid, descending notes, "tree-tree-treeutreeuu-treeuu…", usually delivered in display-flight and preceded by wing-fripping; in Gabon, PRCongo and DRCongo male's flight song, duration c. 6 seconds, is quite different, one type starting with high, thin note that turns into hard trill and ends with a series of rapid "chup" notes, decelerating and descending scale as it progresses, "wheeeeeeeee-rrrrrrrrrrrrrrupupupchupchupchupchupchup", another type beginning with decelerating rattle and ending with c. 12 downslurred whistles, "ratttatatatatatatatataataa-chyoo-chyoo-chyoo-chyoo...", and in third type whistles may be omitted and rattle a steady churr on one pitch; in E & S Africa male sings a series of 8–30 (usually c. 12) liquid double whistles descending the scale, becoming progressively longer, loudest in middle and dying away at end, "chi-cheeya-cheeya-chooyu-chooyu-chooyu…" or "weeo, wewo-wo, wee-wo-kew-kew-kew-tu-tut-tu-tu"; female sometimes responds in duet with soft, nasal "cheru-cheru-cheru..."; variable, sometimes notes wheezy rather than clear whistles. Song from perch a harsh "jwee-jwee-jwee-jweeu-jweeu-jweeu…"; also a conversational medley of buzzy notes and trills interspersed with *Oriolus*-like "quooeeoo". Contact calls "jwee", "jip", "toptop", a hard trill, a hoarse "jaw" and a rasping medley; alarm "chuk-chuk..."; several other notes described, including a courtship song of nasal "pitcheuu-pitcheuu" and tearing, trilling whistles.
Habitat. Thickets in variety of bushy, wooded savannas, mainly at low and medium altitudes. Forest-savanna edges, abandoned forest clearings; gallery forests in N DRCongo, scrub with Solanaceae and derelict farmland in Liberia; also old cultivations and gardens, and brachystegia (*Brachystegia*), mopane (*Colophospermum*) and other broadleaf woods; bracken briar, elephant grass (*Pennisetum purpureum*) and bushes at edges of bamboo at 1800 m in Malawi and 2250 m in E DRCongo; thickets in arid acacia (*Acacia*) thornbush in SW of range; in Zimbabwe avoids brachystegia and favours nearby valleys with rank forest-edge secondary growth.
Food and Feeding. Mainly insects, including grasshoppers and nymphs, and crickets (Orthoptera), moths and caterpillars (Lepidoptera), tenebrionid and other beetles (Coleoptera), mantids and their egg cases (Mantidae); also spiders (Araneae), and a few small lizards; once a hairless *Leggada* mouse, pulped and disembowelled, fed to nestling. Forages largely on ground beneath bushes, running about and hopping as it searches bases of plants, low branches and foliage; occasionally takes insect in flight. Often in mixed-species foraging flocks. Less arboreal than *T. senegalus*; skulking and retiring, and seldom perches for long in the open.
Breeding. Season May–Jun in Ghana, Mar and Aug–Oct in Cameroon, Aug–Feb in Gabon, Dec in Sudan; Aug–Nov in Angola, Oct in SE DRCongo (Katanga); Sept and Dec–Apr in Uganda, Dec–Oct (mainly Feb–Jun) in Kenya and NE Tanzania, Oct–Jun (mainly Nov–Mar) in rest of Tanzania; Sept–Mar in Zambia and Malawi, Sept–Feb (mainly Oct–Dec) in Zimbabwe, Sept and Nov in Mozambique; in South Africa, Sept–Apr (mainly Oct–Dec) in N but Oct–Nov in KwaZulu-Natal; probably single-brooded. Male defends territory with repeated song flights, first zigzags up bush or small tree to top, where it often sings, posturing and swinging tail, then makes steep upward flight with loud bursts of wing-fripping to a few metres above vegetation, raises head, erects crest, usually fluffs rump feathers and fans tail (white terminal spots prominent), and glides somewhat jerkily down, often landing 20–60 m from take-off place; several individuals can display excitedly together, flying from bush to bush, tails cocked and flicking, repeatedly fripping wings and making "chuk-chuk" and other calls. In courtship male postures in front of female while giving variety of complex calls; he bows, stretches body up, with bill pointing upward, cocks, fans and flicks tail, and makes side-to-side movements of body. Nest, built by both sexes in c. 7 days, a shallow, thin-walled cup of fine twigs, rootlets, leaf stems and coarse grass, lined with finer grass and rootlets, sometimes with feathers, bound on outside with spider web; well concealed c. 1 m above ground on fork of shrub. Clutch 2–4 eggs, average 2·3 in E Africa and 2·4 in S, laid at intervals of 24–48 hours; incubation by both sexes, mainly by female, fed on nest by male, often beginning with first egg laid, period 13–16 days; male returning to nest performs display-flights, which seem to signal nest-relief; chicks fed by both parents, nestling period c. 15–16 days; young remain with parents in family party for at least 5 months, in Malawi becoming independent probably at 6–7 months. Nests sometimes destroyed by rats (*Rattus*), mongooses (Herpestidae), snakes and ants (Formicidae). Longevity more than 6·5 years.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Widespread and locally common over vast range. In S Mozambique (Sul do Save), density varies from less than 5 birds/100 ha to 8 birds/100 ha, according to woodland type; in N South Africa, 1 pair/20 ha in acacia woodland and 1 pair/25 ha in broadleaf woodland; in Swaziland, 2·5–15 birds/200 ha in various habitats. In Kalahari (Botswana), 68 birds seen in transect counts in a dry season following good rains, 34 in next wet season, when rains poor, and only four in following dry season, when area was drought-stricken. Susceptible to disturbance when breeding.
Bibliography. Bannerman (1939a, 1953), Bates (1911, 1930), Benson & Benson (1977), Benson *et al.* (1971), Borrow & Demey (2001), Britton (1968, 1977, 1980), Brosset & Érard (1986), Brown & Britton (1980), Chapin (1954), Clancey (1969, 1971a, 1980a), Colston & Curry-Lindahl (1986), Cordeiro & Githiru (2000), Colston & Curry-Lindahl (1986), Cyrus & Robson (1980), Dean (1974a, 2000b), Dean *et al.* (2003), Demey & Fishpool (1994), Dowsett & Dowsett-Lemaire (1980, 1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire (1997a), Elgood *et al.* (1994), Fishpool & Evans (2001), Fry *et al.* (2000), Fuchs *et al.* (2005), Gatter (1997), Grimes (1987), Hall & Moreau (1970), Hanmer (1978, 1983, 1989, 2001b), Harris & Arnott (1988), Harris & Franklin (2000), Harrison *et al.* (1997), Herremans (2004), Irwin (1981), Keith & Twomey (1968), Kopij (2005), Leisler & Winkler (2001), Lippens & Wille (1976), Louette (1981), Lynes (1934), Mackworth-Praed & Grant (1960, 1963, 1973), Maclean (1993), Maclean & Vernon (1976), Markus (1972), McCarthy (2006), Monadjem (2002a, 2002b, 2003), Moreau & Moreau (1940), Nguembock *et al.* (2008), Nikolaus (1987, 1989), Penry (1994), Priest (1948), Rand (1951), da Rosa Pinto & Lamm (1955), Salewski (2000), Schouteden (1969), Serle (1950), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Smithers (1964), van Someren (1956), Stevenson & Fanshawe (2002), Steyn (1996), Symes *et al.* (2002), Tarboton *et al.* (1987), Thiollay (1985), Traylor (1963, 1965), Tyler & Tyler (1996), Vincent (1949), White (1962), Zimmerman *et al.* (1996).

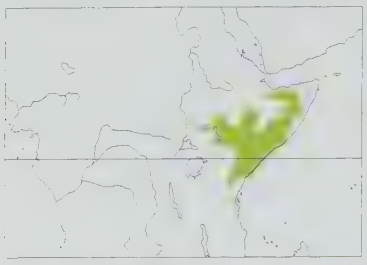
8. Three-streaked Tchagra

Tchagra jamesi

French: Tchagra de James **German**: Somalitschagra **Spanish**: Chagra de James
Other common names: James's Tchagra

Taxonomy. *Telephonus jamesi* Shelley, 1885, Goolis Mountains, Somalia.
Forms a superspecies with *T. australis* and *T. tchagra*; has hybridized with former. Two subspecies recognized.
Subspecies and Distribution.
T. j. jamesi (Shelley, 1885) – extreme SE Sudan, NE Uganda, S Ethiopia, Somalia, N & E Kenya (except coast) and extreme NE Tanzania.
T. j. mandanus (Neumann, 1903) – islands of Lamu and Manda and adjacent Kenya coast (W to Witu and R Tana delta).
Descriptive notes. 16–17 cm; male 22–30 g, two females 26–27 g, unsexed 24–32 g. Nominate race has crown and side of head greyish-brown, narrow black median stripe from bill to nape, black lores and line behind eye, poorly demarcated greyish-white superciliary stripe; upperparts greyish-brown, mantle and scapulars with olive tinge; central tail feathers greyish-brown with fine dark bars, rest of tail blackish, rectrix T2 with small triangular white spot at tip, T3–T6 with white at tips increasing in size towards shorter outer feathers, narrow white wedge on outer web of T6; primaries and secondaries dark brown, base of outer webs of primaries and entire outer webs of secondaries

On following pages: 9. Southern Tchagra (*Tchagra tchagra*); 10. Black-crowned Tchagra (*Tchagra senegalus*); 11. Marsh Tchagra (*Tchagra minutus*); 12. Sabine's Puffback (*Dryoscopus sabini*); 13. Pink-footed Puffback (*Dryoscopus angolensis*); 14. Red-eyed Puffback (*Dryoscopus senegalensis*); 15. Black-backed Puffback (*Dryoscopus cubla*); 16. Northern Puffback (*Dryoscopus gambensis*); 17. Pringle's Puffback (*Dryoscopus pringlii*).



rufous, tertials brown, alula dark brown, feathers with white outer webs; primary coverts brown with rufous outer webs; greater coverts rufous, innermost ones with brown centres, median and lesser coverts rufous; chin and throat buffish-white, underparts grey-buff, darker on breast and flanks, whiter on belly; axillaries and underwing-coverts pale grey, inner borders of remiges pale brown; iris dark brown, ring of white or silvery dots surrounding pupil; bill black; legs slate-grey, blue-grey or olive-green, soles white. Sexes alike. Juvenile and immature are like adult, but stripes on head blackish-brown, side of crown paler and buffier, tail more pointed, white tips tinged buff, breast, belly and flanks buffier, upper mandible slaty, lower mandible slaty with horn base. Race *mandanus* is a little paler than nominate, black crownstripe wider, underparts sandier and less ashy, belly whiter. Voice. Male song in display-flight, preceded by mechanical wing-fripping, a series of emphatic downslurred whistles descending the scale, "wi-weo-weo-weo-weo", "tui-tui-tui-tui-tui…" or "chweeo-chweeo-chweeo", like song of *T. australis* but slightly higher-pitched, individual notes more distinct; whether female ever joins in is not known. Scolds with nasal "chuwaa" and "cherraa-cherraa"; frips wings.

Habitat. Semi-desert, with thickets of dense low thorn-scrub in arid and semi-arid acacia (*Acacia*) bushland and *Commiphora* woodland; wind-stunted aloe (*Aloe*) bushes. From sea-level to 1100 m in Kenya, to 1200 m in Ethiopia.

Food and Feeding. Insects, including cockroaches (Blattodea), mantis egg cases (Mantidae) and moths (Lepidoptera); possibly preys on chicks in Red-billed Quelea (*Quelea quelea*) colonies. Shy and skulking; creeps about in low, dense woody cover but can forage up to 4 m above ground in acacia trees; probably feeds largely on ground. Joins mixed-species foraging flocks in dense cover.

Breeding. Poorly studied. Season Dec in S Sudan, Mar–Apr in Somalia, and Mar–Jul (mainly Apr–May) in S Ethiopia; May on Kenya coast and Manda I (race *mandanus*). Territory advertised with conspicuous song flight, in which bird ascends with wing-fripping, then glides down with tail held fanned; apparently, same flight used for courtship. Nest a small, shallow, compact cup made of dry grass stems, twigs and bark fibres interwoven with some spider web, lined with small rootlets; placed 1–3 m up on fork in thorn bush, often an isolated one. Clutch 2–3 eggs; incubation by both sexes. No further information.

Movements. Resident.

Status and Conservation. Not globally threatened. In SE Sudan, fairly common in Natoporoputh Hills; rather uncommon in Ethiopia; in Somalia, locally common and widespread but absent from most of NE and coastal areas N of 4° N. In Kenya, locally common N & E of highlands, S to Kerio valley, L Bogoria, Samburu, Meru and Tsavo; local in Turkana, confined to regions near Sudan border. Rare in Uganda, where only about five records, near Kenya border in and to N of Mount Moroto Forest Reserve. Only just enters NE Tanzania (near Mkomazi).

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9. Southern Tchagra

Tchagra tchagra

French: Tchagra du Cap **German**: Kaptschagra **Spanish**: Chagra de El Cabo
Other common names: Levaillant's Tchagra, Tchagra Shrike

Taxonomy. *Thamnophilus tchagra* Vieillot, 1816, "Senegal … to Cafferland" = Gamtoos River, South Africa.

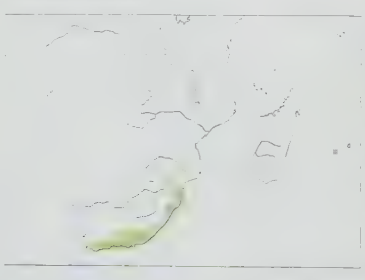
Forms a superspecies with *T. australis* and *T. jamesi*. Three subspecies recognized.

Subspecies and Distribution.

T. t. natalensis (Reichenow, 1903) – NE South Africa (E Mpumalanga and KwaZulu-Natal) and W Swaziland.

T. t. caffrariae Quickelberge, 1967 – Eastern Cape from KwaZulu-Natal border S to area of R Great Fish.

T. t. tchagra (Vieillot, 1816) – S South Africa from S Western Cape E to S Eastern Cape (E to Uitenhage region).



Descriptive notes. 20–22 cm; 38–54 g. Nominate race has crown rich dark brown, broad whitish superciliary stripe, black lores and black stripe behind eye (lower eyelid feathers white); upperparts dull brown, rump tinged greyish; central tail feathers dark grey-brown with many, regular, narrow dark bars, remaining rectrices blackish with white tip, white increasing in size outwards to 11 mm on inner web of outermost feather, which has long white wedge along outer web; remiges, primary coverts and greater upperwing-coverts dark olive-brown, outer webs fringed bright rufous, median and lesser coverts dark rufous; ear-coverts and cheek pale grey-brown; chin and throat greyish-white, underparts grey, darker and olive-tinged on side of breast and flanks; underwing-coverts and axillaries dusky grey-brown; iris very dark brown; bill black; legs slaty or bluish-grey. Differs from very similar *T. australis* mainly in larger size and longer and more robust bill (bill 31 mm long, as against 21 mm). Sexes alike. Juvenile is like adult, but upperparts duller, more olive-tinged, underparts buff-tinged, supercilium and tips of tail feathers buffy, tail more pointed, lower mandible with pale base. Race *caffrariae* has crown chestnut-brown, superciliary stripe buffy, flanks, thighs and undertail-coverts olive-tinged, also bill 1·5 mm shorter than that of nominate; *natalensis* has crown redder still than previous, upperparts brighter, underparts much paler, also is slightly smaller than nominate (wing 3–5 mm shorter, bill 2·5–3 mm shorter). Voice. Song of male, delivered in flight and preceded by wing-fripping, a trill followed by short stuttering, croaking notes and then loud, liquid, progressively longer whistles, usually 10–20 (but up to 30), on one pitch and seeming to decelerate as notes lengthen, "trrrrr-itititititi-tyi-tyi-tyi-tewp-tewp-tewp-tewp…"; slower version has no preliminary trill, only a few short notes and then a long series of loud even-pitched whistles, "tyio-tyi-wheeeoo-wheeeoo-wheeeoo-wheeeoo-hooee-hooee-hooee-tooiyup-tooiyup-toooiyup…". After male alights from display-flight the whistles may continue, and male often utters tearing "tzzerrr-tzzerrr" or "sskwirrr…", like calls of *Dryoscopus* species; similar call sometimes given by female when singing at same time as male. Common call a harsh "tschagra"; in aggressive interactions, a complex medley of purring, trilling and tearing sounds, as well as wing-fripping; alarm a searing "neeeaaa"; contact call a quiet "twet" when two individuals foraging close together, a louder harsh "tzzerrr" when farther apart.

Habitat. Ecotonal scrub between grassland and montane, riparian, gulley and coastal forest; dense littoral bush, edges of and clearings in coastal dune-forest, tangles of *Lantana*, brush piles around rural cultivation, dry *Euphorbia* forest and thickets of *Acacia cyclops*; in drier country inhabits thornveld and dense *Acacia* riverine scrub; locally in bracken and scrub between forest and grassland at 1100–1275 m.

Food and Feeding. Insects, including beetles (Coleoptera), corn crickets (Orthoptera) and larvae; also berries and small molluscs. Forages on ground, where it runs and hops about, flicking over debris in manner of a *Turdus* thrush; also searches for food low down in dense low vegetation.

Breeding. Season Sept–Dec in KwaZulu-Natal and Aug–Mar (mainly Sept–Nov) in Western Cape and Eastern Cape; sometimes double-brooded. Advertises and defends territory by wing-fripping followed by song flight (sometimes song from perch) generally low over bushes, often circling; ascends rapidly, fripping wings, rump feathers held fluffed out, at top of ascent head held high and crest raised, then glides down with tail broadly fanned, whistling loudly, and on alighting gives harsh "chok-chok-chok" (often followed by more whistles); in intense territorial threat frips wings excitedly, fans tail, moves body jerkily, or makes slow side-to-side movements of head and body, bows, and cocks and flicks tail. Courtship little known, appears similar to territorial threatening. Nest, built probably by both sexes, a broad, shallow, thin-walled cup made of plant fibres, rootlets and twigs, lined with fine rootlets and sometimes hair; placed on twig fork, or sometimes on top of nest of another bird species, seldom more than a metre above ground and well concealed in *Carissa*, *Rhus*, *Olea* or *Sideroxylon* thicket, or often in isolated bush or small, dense and tangled solitary tree; territory c. 4 ha. Clutch 2–3 eggs, usually 2; role of sexes in incubation not known, sitting bird unusually confiding, incubation period 15·5–16 days; chicks fed by both parents, nestling period 13–15 days. Nest sometimes parasitized by Jacobin Cuckoo (*Clamator jacobinus*).

Movements. Resident.

Status and Conservation. Not globally threatened. Uncommon and local in N of range, commoner in S. In SW Cape occurs W to Hermanus and Robertson and N to Beaufort West; common in Little Karoo; fairly common in S & E Cape but sparse in Transkei and Pondoland; in KwaZulu-Natal sparse and local along coast and inland up to 600 m, N to Lebombo Mts at Ingwavuma, in Swaziland; along Drakensberg Escarpment, extending over it and into C lowveld at Eyrie and Graskop, in Mpumalanga. Reported also from Inhaca I, in extreme S Mozambique. In Tierberg drainage-line woods in E Western Cape karoo vegetation, recorded in 20% of 276 1-km transect counts. Likely to have been affected adversely by continuing destruction or modification of coastal dune-forest, but appears to have benefited considerably from spread of such exotic trees as *Acacia cyclops* and of woody growth encroaching on to grassland near forest, as in East London area; some evidence of expansion of range in last 30 years.

Bibliography. Clancey (1964a, 1971a, 1980a), Cyrus & Robson (1980), David & Gosselin (2002b), Dean & Milton (2001), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Fishpool & Evans (2001), Fry *et al.* (2000), Ginn *et al.* (1989), Hall & Moreau (1970), Harris & Arnott (1988), Harris & Franklin (2000), Harrison *et al.* (1997), Hockey *et al.* (1989), Lawson & Edmonds (1983), Mackworth-Praed & Grant (1963), Maclean (1993), Maclean & Vernon (1976), Markus (1972), McCleland (1999), Milstein (1999), Parker (1994, 1999), Priest (1948), Quickelberge (1967), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Sonnenschein & Reyer (1984), Steyn (1996), Tarboton *et al.* (1987), Uys (1989), Uys & Macleod (1967), White (1962), Winterbottom (1962).

10. Black-crowned Tchagra

Tchagra senegalus

French: Tchagra à tête noire **German**: Senegaltschagra **Spanish**: Chagra del Senegal
Other common names: Black-headed Bush-shrike/Tchagra, Black-capped Bush-shrike, Hooded Tchagra; Moroccan Tchagra (*cucullatus*)

Taxonomy. *Lanius senegalus* Linnaeus, 1766, Senegal.

Closely allied with the "*T. australis* superspecies", yet completely sympatric with it. Race *remigialis* intergrades with *nothus* around L Chad. Some geographical variation trivial and clinal; race *warsangliensis* sometimes subsumed in *habessinicus*. At least 17 races have been described; *pallidus* synonymized with nominate and *timbuktanus* with *nothus*, also *camerunensis*, *sudanensis* and *rufofuscus* subsumed in *armenus*, and *mozambicus* and *confusus* in *orientalis*. Ten subspecies currently recognized.

Subspecies and Distribution.

T. s. cucullatus (Temminck, 1840) – Morocco E to N Tunisia and NW Libya.

T. s. senegalus (Linnaeus, 1766) – S Mauritania S to Liberia, E to S Mali (S from Mopti), Nigeria (except far N), S Chad and Central African Republic.

T. s. nothus (Reichenow, 1920) – borders of Sahara from C Mali E to L Chad.

T. s. remigialis (Hartlaub & Finsch, 1870) – L Chad E to W & C Sudan (Darfur, Kordofan and C Nile Valley).

T. s. armenus (Oberholser, 1906) – S Cameroon E to N DRCongo, SW Sudan (Bahr el Ghazal) and Uganda, S in W to Angola (S to W & C Huíla and Cuando Cubango) and, in E, to Kenya (except coast), Tanzania (except E lowlands), N Zimbabwe, Malawi and NW Mozambique.

T. s. habessinicus (Ehrenberg, 1833) – S Sudan (E from Imatong Mts), Ethiopia, Eritrea, Djibouti and NW Somalia.

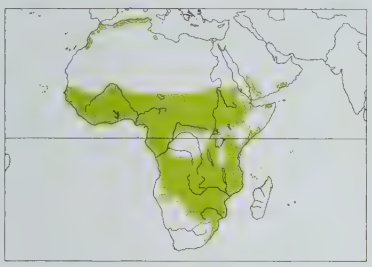
T. s. percivali (Ogilvie-Grant, 1900) – SW Saudi Arabia, W & E Yemen and S Oman.

T. s. warsangliensis S. R. Clarke, 1919 – Warsangli area of N Somalia.

T. s. kalahari (Roberts, 1932) – S Angola (E Huíla E to SE Cuando Cubango), N Namibia, SW Zambia, Botswana, NW Zimbabwe, and N South Africa (North West Province and W Limpopo).

T. s. orientalis (Cabanis, 1869) – S Somalia, coastal Kenya, E Tanzanian lowlands, Mozambique (except Tete region), Zimbabwe (except N & NW), NE & E South Africa and Swaziland.

Descriptive notes. 19·5–23 cm; 42–53 g (*armenus*), 48–55 g (*orientalis*). Nominate race has crown, lores and stripe behind eye black, long broad superciliary stripe very pale buff to whitish; hindneck, mantle and inner scapulars pale brownish, outer scapulars blackish-brown with broad rufous fringes, rump grey, uppertail-coverts greyish-brown; strongly graduated tail (c. 95 mm long), central feathers dark greyish-brown with evenly spaced narrow dark bars, remaining feathers black with broad white tip, white c. 5 mm deep on T2, c. 180 mm deep on inner web of outermost rectrix (T6), latter with long white wedge on outer web; primaries and secondaries are blackish with narrow rufous outer edges,



tertials black with broad bright rufous edges, upperwing-coverts rufous; side of head and neck tawny-brown, grey-brown towards throat; pale grey below, whiter on chin, middle of throat, belly and undertail-coverts, darker on side of breast and flanks; underwing-coverts and axillaries pale rufous, inner edges of flight-feathers pale buff; iris greyish-mauve, some birds with ring of tiny white dots around pupil; bill black; legs grey. Sexes alike. Juvenile is like adult, but crown mottled brown and blackish, stripe behind eye dark brown, supercilium and cheek buffy, tail buff-tipped and more pointed, underparts buffier, bill grey-brown, base of lower mandible paler. Races vary mostly in tone of plumage, in size and in tail length: *nothus* is rather larger and longer-tailed than nominate, also paler, greyish-brown above, white chin, throat, belly and undertail-coverts, pale grey breast and flanks; *remigialis* is paler still, very pale tawny-brown above, wings pale rufous, almost white below, buff tinge on breast and flanks, underwing-coverts white; *armenus* is slightly darker and more tawny-brown above and darker grey below than nominate; *habessinicus* is like previous but darker and greyer, with supercilium narrower; underwing-coverts greyish; *warsangliensis* is like last, but upperparts still darker and greyer, cheek greyer, wing 8–13 mm shorter than in other races; *orientalis* resembles *armenus*, but cheek and ear-coverts browner, less greyish, and underparts slightly paler; *kalahari* is like preceding race, but slightly paler and greyer above, supercilium paler buff, underparts whiter; *cucullatus* is large (wing 92 mm), with tail very long (118 mm), has upperparts darker and greyer-tinged than *armenus*, cheek and ear-coverts darker grey-buff, underparts darker and greyer, underwing-coverts dark cinnamon; *percivali* is distinctive, upperparts and underparts uniform dark grey, but chin and throat white, differs from all other races in lacking any vestige of black or rufous on scapulars and in having central tail feathers black (not grey-brown), supercilium white, tertials unpatterned. VOICE. Song of male a series of rich, lilting, mellow, warbling whistles, sweeter, slower and more deliberate than those of congeners, descending scale and becoming slower: "whee, hooee, heeyoo, hyooo, hooey..."; much individual, seasonal and geographical variation (e.g. two populations 120 km apart in Morocco have substantially different songs). Song of female a hard, rattling, descending trill, given in duet before, during or after male's song; other duets are (presumed female's) chatter and (presumed male's) single, loud, slurred whistle, "trrrrr-hooeeeyou-trrrrr" or "chchchch-huweeyee-chchchch". Race *cucullatus* male has three main songs, i.e. territorial song of 1–3 whistles followed by three descending phrases each of 3 falling notes, a similar song but not descending (each phrase with first 2 notes on same pitch and third note lower-pitched and almost disyllabic), and up to 10 sonorous, mournful, descending whistles; female *cucullatus* sings only third song type; there are strong local dialects. Aggressive interactions and territorial threats involved counter-singing and complex, excited duetting with explosive, whooping whistles, rolling trills, bubbling, tearing and clashing sounds, and much wing-fripping; one bird may give throaty "chrrrrrwee", other replying with low drawn-out "whooooo". Emits "chuk-chuk" notes in mild alarm, harsh tearing sounds in intense alarm.

Habitat. Wide variety of open grassy situations with bushes, thickets and small trees. In Morocco scrubby semi-desert, dry open forest, plantations, gardens, *Argania spinosa* woodland, *Thyula* scrub, dense macchia, bushy slopes and ravines in foothills, stands of olives (*Olea*), holm oaks (*Quercus ilex*) and *Cistus*; in W Africa, sparse acacia (*Acacia*) and *Salvadora* scrub, farmland, suburban gardens, riverine forest; in Ethiopia, mixed forest of olive, juniper (*Juniperus*) and *Podocarpus* at up to 3000 m, and in lowlands semi-desert thornbush, acacia and broadleaf savannas. From sea-level to 1900 m in Cameroon, 1650 m in Uganda, 2300 m in Eritrea and 3000 m in Ethiopia. In S Africa, occurs from sea-level to 1400 m in light deciduous woodland with underlying rank grass, brachystegia (*Brachystegia*) and mopane (*Colophospermum*) woods, bushveld, overgrown eucalypt (*Eucalyptus*) plantations, and coastal thickets.

Food and Feeding. Eats mainly insects, including grasshoppers (Acrididae) up to 6 cm long, crickets (Gryllidae), beetles and their larvae (Coleoptera), caterpillars, wasps (Hymenoptera), cicadas (Cicadidae), termites (Isoptera), mantises and nymphs (Mantidae); also small fruits, including *Lycium* berries; also worms (Annelida), spiders (Araneae), scorpions (Scorpiones), snails (Gastropoda), frogs, tadpoles, small lizards and snakes. Regurgitates pellets of c. 8·5 × 13 mm. Forages on ground under cover of woody growth and low down in vegetation. Hops, leaps, lopes and runs about on ground, searching slowly and carefully, flicking aside debris with bill in manner of a *Turdus* thrush; pulls dung apart; jumps up to take insect from low vegetation. Creeps around in bushes, searching trunks, branches and foliage; hammers snails off branches and eats them on the ground. Carefully wipes large hairy caterpillars on the ground before consuming them. Sometimes takes aerial prey. Joins mixed-species feeding flocks.

Breeding. Season May–Jun in Morocco and Apr–May in Tunisia; Aug in Mauritania, Jul in Senegal and Oct–Nov in Gambia; in Ghana, Apr–Jun in S and Jul–Sept in N; Jun–Jul in SW Niger and Feb–Sept (mainly Jul–Aug) in Nigeria; Aug–Nov in Sudan, Apr–Jul in Ethiopia, May in Oman; Sept–Nov in E & S DRCongo, Feb, May–Jun and Aug in Uganda, all year (mainly in early rains) in Kenya and N Tanzania; Aug–Oct in Angola, Sept–Jun (mainly Oct–Nov) in Zambia, Oct–May in Malawi, Sept–Mar in Mozambique, Dec in Botswana, Aug–Apr (mainly Sept–Dec) in Zimbabwe, and Sept–Feb (mainly Oct–Dec) in South Africa. Male defends breeding territory for much of year, advertises it by singing in display-flights, rising steeply to height of 10–15 m, fripping wings loudly and repeatedly as he does so, head held up and tail depressed, at highest point raises crest, and then glides down in arc of as much as 60 m, with intermittent jerky movements, singing lilting whistles and fanning tail widely before alighting; occasionally female accompanies male in similar flight and may call in duet; rival males conduct vigorous song-duels on ground or in bush, dominance established vocally and, at perch, by height which upstretched bird can reach. Courtship involves same display-flights; female joins male in duet, often zigzagging up through bush to perch upright just below him; pair performs elaborate duets while in steeply upright posture and variously cocking, lowering, rotating and sometimes fanning tail, moving head and body slowly from side to side, and bowing; several males may chase one female. Nest built by both sexes, a shallow compact cup made of rootlets, fine twigs and tendrils, lined with grass stems and finer rootlets, sometimes bound with spider web on rim and decorated with dry leaves or snakeskin, sited up to 6 m (mainly c. 2 m) above ground in horizontal or vertical fork in bush or small tree; territory 4–25 ha, often c. 10 ha. Clutch 1–4 eggs, usually 2–3; two egg types in Nigeria (see page 76); incubation by both sexes, mainly by female, which sits very tight, relieving male alights in nest tree and works his way up (or down) to nest, partners exchange calls for up to 2 minutes before she leaves, incubation period 12–15 days; chicks fed by both parents, nestling period 14–16 days; fledged young remain with parents for several months.

Movements. Resident; some evidence of local movements in NW Africa, in extreme N parts of range in W Africa, and in Malawi.

Status and Conservation. Not globally threatened. Generally common. Uncommon to locally common in Morocco and Algeria, commoner in Tunisia; in Morocco, density in *Thyula* scrub 8 pairs/km², in macchia 2·7 pairs/km², in woodland 1·3 pairs/km². Fairly common and widespread in SW Arabia wherever light woodland occurs. In sub-Saharan Africa, common and locally almost abundant throughout most of vast range; density in Odzala National Park (PRCongo) and Limpopo Province (N South Africa) c. 4 pairs/km²; in four Swaziland acacia savannas, respectively 25, 33, 58 and 150 birds/10 km². Population in S Mozambique (Sul do Save Province) possibly in excess of 500,000 individuals. Many of this species are killed for traditional medicine, e.g. in Benin (for supposedly improving memory) and in Nigeria (where claimed to aid talent).

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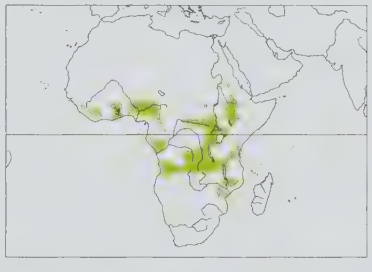
11. Marsh Tchagra

Tchagra minutus

French: Tchagra des marais **German**: Sumpftschagra **Spanish**: Chagra Marismeña
Other common names: Blackcap Bush-shrike, Black-capped Shrike/Bush-shrike, Blackcap(ped)/Little Blackcap Tchagra, Lesser/Little Tchagra/Shrike/Bush-shrike; Anchieta's Tchagra, Southern Blackcap (*anchietae*, *reichenowi* and *remotus*)

Taxonomy. *Telephonus minutus* Hartlaub, 1858, Ashanti, Ghana.
Somewhat aberrant species, sometimes treated in a monotypic genus *Antichromus* or *Bocagia*; differences from congeners moderately notable genetically, but morphologically and biologically no greater than differences among species within other malaconotid genera. Nominate sometimes separated from other races as a distinct species. Races *anchietae*, *reichenowi* and *remotus* intergrade where they meet; whether nominate and *anchietae* also do so is not known. Four subspecies recognized.

Subspecies and Distribution.
T. m. minutus (Hartlaub, 1858) – Sierra Leone E discontinuously to lower R Congo, N & E DRCongo (S to NW shores of L Tanganyika), S & E Sudan, Ethiopia, W Kenya and NW Tanzania.
T. m. anchietae (Bocage, 1869) – Angola, S & SE DRCongo, N Zambia, SW Tanzania and N & W Malawi.
T. m. reichenowi (Neumann, 1900) – E, C & S Tanzania (coastal lowlands S to R Rufiji, and inland in S Dodoma, Morogoro, Iringa and Songea).
T. m. remotus Clancey, 1959 – SE Malawi, N & W Mozambique and E Zimbabwe.



Descriptive notes. 15–19 cm; male 25–38 g, female 30–37 g, unsexed 32–41 g. A rather small, large-headed, thickset tchagra with comparatively short graduated tail; bill shorter and relatively wider than that of congeners. Male nominate race has glossy black head, whitish cheek, dark rufous-brown mantle, back and upperwing, rump slightly greyer; scapulars black, innermost with rufous inner web, outermost with rufous outer web and tip; tail blackish, feather tips buff, narrow on central pair and increasing in depth outwards, T5 with 5 mm of buff at tip, T6 also with buff outer margin; chin white, throat buffy white, underparts rich ochre; large rufous-buff area on underwing formed by broad inner borders of flight-feathers; iris pinkish-brown or reddish-brown; bill black; legs dark grey. Female is like male, but has striking, well-defined superciliary stripe from base of bill to above ear-coverts. Juvenile initially (one week after leaving nest) looks almost white-headed, has forehead, crown and nape white, dusky stripe through eye, broken blackish lateral crownstripe above white supercilium, with throat, side of head and hindneck very pale buff, eye black, bill bluish-grey with yellowish cutting edges; later is like female but supercilium buffy white, crown streaked and mottled, mantle and scapulars with blackish streaks, tail dark brownish-black, underparts buffier, bill horn-coloured, base of lower mandible paler, eye grey-brown; immature plumage transitional between those of juvenile and adult, buffy supercilium becoming black on male and white on female. Race *anchietae* is like nominate, but scapulars dark rufous-brown (concolorous with back and wings), wing on average 3 mm longer; *reichenowi* is like previous but less richly coloured, black crown separated from rufous of mantle by buffish-white hindneck, buff tail-feather tips greyish subterminally, same size as nominate; *remotus* resembles last, but slightly paler and larger. VOICE. Song of male, in display-flight preceded by muffled wing-fripping, is short, cheery whistled "tuwee-twer-tuweet" or "chee-chu-chweeoo" (nominate race), or "tuweetilweuu" (*remotus*) or trilling "pirree ti-weep peeeu" (*anchietae*); female often responds in duet with nasal "cherrrruu"; in territorial aggressiveness, songs of both sexes often followed by discordant, rapid "tzzerrr-tzzerrr, tzzrrrr-tzzrrrr" notes. Alarm "klok", "tchup" or repeated harsh "tzik"; contact call a softer "tzik-tzik" by male, answered with nasal bleating by female.

Habitat. Rank waterside vegetation with moist grassy hollows, scattered bushes and elephant grass (*Pennisetum purpureum*); edges of marshes, papyrus (*Cyperus papyrus*) swamps and coastal lagoons; streamside reeds, damp forest borders, abandoned cultivation with regenerating scrub; sugarcane and maize crops. In Ethiopia long rank grass with scattered trees and bushes, in particular *Hyparrhenia*, in combretaceous woodland; also in cotton and coffee plantations; in PRCongo common in dambos with patches of *Jardinea* and *Clappertonia*. Mainly at low altitudes, but at higher

elevations (up to 2150 m) in Zambia and Malawi inhabits bracken briar; occurs at up to 2000 m in E Africa, 1800 m in Cameroon and 1450 m in Zimbabwe.
Food and Feeding. Quite large insects, including grasshoppers (Acrididae), beetles (Coleoptera), dragonflies (Odonata) and bugs (Hemiptera). Forages low down in vegetation, while clinging to reeds and grass stems; searches trunks, branches and foliage. Sometimes feeds on ground, and hawks insects in flight.
Breeding. Not well studied. Season Sept in Ghana, Jun–Jul in Nigeria and Oct in Sudan; various evidence indicates breeding in Feb–Jun and Sept in Uganda; May–Jun and Nov in Kenya and N Tanzania; Oct in Angola; in DRCongo, Jul–Oct (Uele) and Sept–Mar (Katanga); Nov–Dec in Zambia, Nov in Malawi, Nov–Mar in Zimbabwe, and Dec–Mar in Mozambique. Monogamous and territorial. In mornings and evenings perches boldly for long periods on tall grass stem or bush up to 5 m high, in upright posture with tail depressed a little; territorial male rises in air with muffled wing-fripping, at apex raises head and crest and sings while gliding back to perch with tail fanned; female may join male in giving less elaborate song flight; in aggressive territorial interactions song flights made repeatedly, singing combined with calls; in bushes males, sometimes with a female, move about excitedly, bowing, swaying body jerkily from side to side, cocking tail and flicking wings. Courtship apparently involves same song flight, male fluffing out rump feathers and chasing female, both sexes making nasal mewing calls. Nest built by both sexes, a deep, thin-walled cup made of thin, pliant, interlocking rootlets, woody stems and tendrils, sometimes bound on outside with a little spider web, often decorated copiously with fragments of snakeskin, sometimes lined with fine grass, moss and down; sited 0·8–1·8 m above ground in upright fork in bush, fork partly incorporated into sides of nest; nest can be reused for second brood; pair lives throughout year in territory of c. 1 ha. Clutch 1–3 eggs, usually 2–3; incubation by both sexes, in subequal spells of 40–60 minutes; no information on duration of incubation and nestling periods. Nests probably occasionally parasitized by Black Cuckoo (*Cuculus clamosus*), begging juvenile of which was seen to be accompanied by individual of present species in Benin.
Movements. Resident, perhaps also partially migratory; most records in N part of W African range are in rains, May–Sept.
Status and Conservation. Not globally threatened. Generally uncommon, and frequent or common only locally, within its very large but discontinuous range. This species' evident dependence on swamps suggests that it may be at risk locally and regionally in drought conditions and as a consequence of drainage and water management. Has not been recorded on Kenya coast for decades, and in W of that country no longer occurs in Nairobi, Thika, Murang'a or Nandi areas; presently confined to W of Rift Valley in areas above 1000 m altitude with annual rainfall exceeding 1000 mm. Considered "critically endangered" in Zimbabwe; in 1997, a section of prime habitat, a 4·5-km vlei near Wamba, in Eastern Highlands Tea Estate, was dammed for irrigation, destroying 3·5 km and reducing this species' population from 50 individuals to only 24; in 1998, the remaining 1 km of vlei was taken over for sugar cane and root crops, and by late 2000 only one pair remained; in 1997 there were 12–14 birds in nearby Katiyo Tea Estate, and they, too, had disappeared by 2002 after vlei was planted with bananas and root crops; in 1999, BirdLife Zimbabwe began an educational conservation programme in Honde Valley involving 23 schools, and by 2003 population of this tchagra had increased from two to ten birds.
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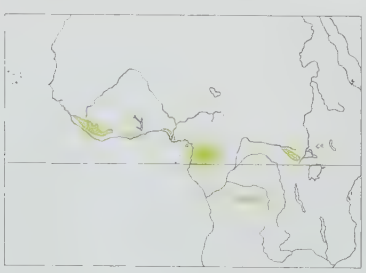
Genus *DRYOSCOPUS* Boie, 1826

12. Sabine's Puffback

Dryoscopus sabini

French: Cubla à gros bec **German**: Dickschnabel-Schneeballwürger **Spanish**: Cubla de Sabine
Other common names: Large-billed Puffback

Taxonomy. *Thamnophilus sabini* J. E. Gray, 1831, Sierra Leone.
Differs from congeners in bill morphology, and has diagnostic whistle call. Two subspecies recognized.
Subspecies and Distribution.
D. s. sabini (J. E. Gray, 1831) – Sierra Leone E to S Nigeria.
D. s. melanoleucus (J. Verreaux & É. Verreaux, 1851) – Cameroon S, discontinuously, to N Angola and patchily in NE, C & S DRCongo.



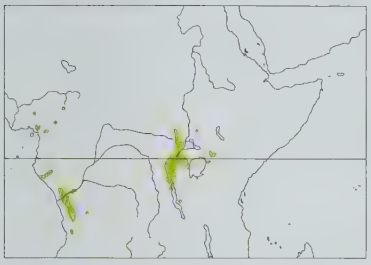
Descriptive notes. 18–19 cm; male 31–44 g, female 32–39. Distinctive puffback with long, robust bill, culmen flat-convex and wide between nostrils; remiges curved, wing very rounded. Male nominate race has forehead to mantle and scapulars, also uppertail-coverts and tail, black with dark blue gloss; back and rump contrastingly white (plumage long, very dense and fluffy); upperwing black, less glossy and less bluish than mantle; entire underparts white, underwing-coverts and axillaries white, underside of remiges slaty black, underside of tail glossy black; iris dark brown; bill greyish-black, upper mandible pale bluish-grey except for black tip and cutting edges; legs blue-grey. Female has forehead, crown, nape and hindneck medium grey, merging into olive-grey on mantle, warm rufescent brown on back and scapulars, and rufous on rump, tail and wing; back and rump plumage thick and fluffy (although less so than male's); pale grey or whitish above eye, joining with narrow white ring around eye; sometimes a short, narrow pale line above lores; lores grey, ear-coverts grey-brown with thin whitish shaft streaks; chin, throat, breast, flanks, and sides of belly and undertail-coverts uniformly pale rufous, centre of belly and vent snow-white; underwing-coverts and axillaries pale rufous, underside of remiges dark grey and of rectrices pale brown; bare parts as for male. Juvenile is thought to be like female; immature male like adult female, young male moulting into adult plumage replaces feathers on upperparts irregularly, has blotchy mix of grey and black feathers on head, of rufous and black feathers on back, tail and wings, and rufous and white patches on underparts. Race *melanoleucus* is almost identical to nominate, but has tail shorter, average 61·5 mm (nominate average 73 mm), and tail of female is slightly darker than that of nominate female. Voice. Song a series usually of 5–15 notes on descending scale, at first short, thin, clipped and high-pitched, like squeaky bicycle pump, gradually becoming longer, louder and somewhat ringing, ending abruptly, "tsee-tsu-tsu-tsu-tsu-tew-tew-tew-tew-teewp-teewp-tewp", very like song of Yellow Longbill (*Macrosphenus flavicans*); short song of 5–6 notes also likened to songs of Gabon Woodpecker (*Dendropicos gabonensis*) and of Olive-green Camaroptera (*Camaroptera chloronota*); song can be of far more than 15 notes, lasting 2–3 minutes. Also nasal rasping "tzrrrrr", "tzwee-tzwee" or "tzrrreeeeu", and has varied repertoire of harsh calls, including loud clicking notes, descending "cheeerrrrr" or "trtrtrtrtr" rattle lasting up to 4 seconds, short "djip", disyllabic "tuk-rrraaa'" or "di-rrrrraaaaa", also contact call "krriéé"; in aggression a grating, upslurred "jooway". Almost in duet, one individual can give hard rattle and mate joins in before it has ended, this often given in flight with much wing-fripping.
Habitat. Canopy of tall primary forest, logged and secondary forests, riparian forest and swamp-forest, edges and thick growth in clearings, old African mahogany (*Khaya ivorensis*) plantations, and suburban gardens with tall timber; often in canopy of emergent trees and in curtains of hanging lianas.
Food and Feeding. Insects, including grasshoppers and crickets (Orthoptera), beetles (Coleoptera), moths and large caterpillars (Lepidoptera), and termites (Isoptera). Keeps at heights above ground of 20–45 m, mainly 30–35 m, hardly ever descending into middle strata. Forages by gleaning conspicuously on twigs and vines and under leaves in outermost branches, examining them closely. In pairs; commonly in mixed-species foraging flocks.
Breeding. Almost unknown. In Liberia, enlarging gonads in Jun, Aug–Sept and Nov, and courtship display seen Aug and Oct–Nov; in Ghana, courtship display in Jul; in Nigeria, courtship display in Jun, enlarged gonads in Oct; in Gabon, family parties seen at end of short dry season and in following wet season. Courtship consists of wing-fripping flights during which white rump feathers puffed out.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally fairly common to rare. Estimated densities of 2–5 pairs/km² in Liberia and 8–10 pairs/km² in Gabon. Uncommon in Sierra Leone, where records from Bo, near Matotaka, and in Sugarloaf Forest, also in logged and primary forest in Gola Forest; eight birds seen in two years in 1930s. Not uncommon in Liberia, where recorded at 35 localities from coast at Cape Mount and Harbel to Nimba highlands and Wologizi range. In Ivory Coast, known from tall forests from Taï and Ayamé to Lamto, Yapo, Daloa, Bossematié, and Anguédédou and Banco National Park (near Abidjan); frequent in the last and in Taï Forest National Park, Yapo and Bossematié. In Ghana, not uncommon from Sunyani, Kumasi and Tesano to forests in extreme SW, including Kakum, and on coast at Axim, Cape Coast and Accra; in 1870s was said to be very common in some areas; in 2005, found to be common in six selectively logged reserved forests, frequent in two others and uncommon in seven more. Single record (on R Gonobé) in Togo; in Benin, recorded twice in Niaouli Forest. In Nigeria, uncommon from near Lagos to Ibadan, Ife, Omo Forest Reserve, Benin and Umuagwu. In Cameroon, frequent at Kumba and Mt Kupé at 850–1300 m, common in Rumpi Hills Forest Reserve, uncommon in Korup National Park, and scarce in Mbam-Djerem National Park; records from Mbonge and SE to R Dja. Uncommon in Gabon S to Lopé National Park, but frequent to common in SW, in Loango and Moukalaba-Doudou National Parks. In PRCongo, common in Nouabalé-Ndoki National Park, frequent in Odzala National Park; in Central African Republic, recorded only in SW (Haute Sangha). Uncommon in Angola in forests of Cabinda, and recorded also from upper R Cuango R in Lunda Norte. Rare in DRCongo, where known from at least seven localities in NE and Ituri, including Avakubi, Ngayu and Mawambi, from Mbandaka and upper R Maringa (on equator), and from at least five places in Kasai, including Kabambaie, Tshikapa and Ngombe.
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13. Pink-footed Puffback

Dryoscopus angolensis

French: Cubla à pieds roses **German**: Rotfuß-Schneeballwürger **Spanish**: Cubla Patirrosada

Taxonomy. *Dryoscopus angolensis* Hartlaub, 1860, Bembe, Loanda Province [= Uíge], Angola.
Apparently most closely allied to *D. sabini*, juveniles of the two being strikingly alike and females very similar to each other in plumage. Race *boydi* not well defined, possibly represents clinal variation and perhaps better merged with nominate. Four subspecies recognized.
Subspecies and Distribution.
D. a. boydi Bannerman, 1938 – extreme SE Nigeria and W Cameroon.
D. a. angolensis Hartlaub, 1860 – S Gabon, S PRCongo, SW DRCongo and NW Angola.
D. a. nandensis Sharpe, 1900 – extreme S Sudan, NE & E DRCongo, W & S Uganda, extreme NW Tanzania, W Rwanda and W Kenya.
D. a. kungwensis Moreau, 1941 – Mt Kungwe Mahale (Mahare), in SW Tanzania.
Descriptive notes. 15–17 cm; 35–40 g. Distinctive puffback with bill comparatively short (shorter than head), quite slender, and not strongly hooked. Male nominate race has forehead to upper mantle black with dark blue gloss, lores, upper cheek and ear-coverts dull greyish-black; lower mantle dark grey, scapulars, back and rump mid-grey to pale grey (white feather bases can show through), uppertail-coverts dark grey; tail very dark brown, feathers structurally barred blackish; upperwing uniformly dark greyish-brown; chin and throat greyish-white, grading into pale grey on



breast and flanks, belly almost white in middle, thighs, vent and undertail-coverts pale grey; underside of tail and underside of flight-feathers shiny dark grey, underwing-coverts and axillaries pale grey or whitish; iris dark brown, edge of sclerotic membrane bright cobalt-blue or violet-blue, rim of eyelids dusky with dark red tinge; bill black; legs pale pink-violet or lilac-grey, claws grey. Female has forehead, crown, hindneck, lores, upper cheek, upper ear-coverts, side of neck and upper mantle uniformly bluish-grey, merging into olive-brown on lower mantle and scapulars; back and rump olivaceous grey, uppertail-coverts olive-brown, tail greyish-brown; lower cheek and lower ear-coverts rufous-buff, slightly streaky; chin, throat, breast and upper flanks light orange or rufous, lower flanks and thighs pale rufescent brown, belly white, greyish-white or creamy white, undertail-coverts whitish or pale rufous; underwing-coverts and axillaries bright rufous, underside of flight-feathers glossy dark grey with inner border of feathers proximally pale rufous; underside of tail ochreous brown; bare parts as for male, but lower mandible pale. Juvenile is like female, but upperparts duller, mantle with olive-brown wash, underparts tawnier, bill pale, eyes brown, legs pinkish-brown. Race *nandensis* male is like nominate, but forehead, crown, nape, lores, upper cheek and upper ear-coverts dull blackish-grey, grading through hindneck into glossy bluish-black on upper mantle, female identical to nominate female; *kungwensis* resembles previous, but male has greyer crown and neck; *boydi* male has slightly greyer head than nominate male and is a little smaller. Voice. Not very vocal. Variety of harsh, clipped calls, "jack", "djik", "chit-tup" and "jyoop-jyoop"; also a short, hard dry trill, perhaps the same as a reportedly harsh churring or jarring "tzik-tzzik" contact call given by both sexes; emphatic, grating "tchew" or "cheow" repeated unevenly up to 30 times; three males chasing each other gave loud "krrraa" rattles preceded by "pik pik".

Habitat. Mature montane forest at intermediate altitudes, but sometimes down to sea-level, also old second growth; also young, scrubby secondary growth and edges and interior of coffee forest; up to 2500 m.

Food and Feeding. Insects, mainly beetles (Coleoptera), also grasshoppers (Acrididae) and caterpillars. Keeps mainly in foliage high up in trees, although often comes down to middle levels of forest. Hops through and gleans foliage on large subcanopy branches, usually silently, moving much like a large sylviid warbler. Usually in pairs, sometimes singly; commonly joins mixed-species foraging flocks.

Breeding. Barely known. Birds in breeding condition in Apr in Cameroon; various evidence of breeding in Jan, Apr–Jun and Nov in E DRCongo (Itombwe) and in Jan, Mar and Sept in Uganda. Nest a substantial lichen-covered cup, incorporating spider web, one placed c. 7 m up in dense foliage on creeper-covered dead tree; a female carried large clump of green moss to presumed nest 8–13 m above ground in Bwindi Impenetrable Forest, in Uganda. No other information.

Movements. Resident. Records on Cameroon coast suggest that part of Mt Cameroon population may move to lower levels in non-breeding season.

Status and Conservation. Not globally threatened. Locally common to uncommon. Range highly fragmented, with main centres in W Cameroon, NW Angola, Rift Valley mountains, and isolated montane outliers. Few records in Nigeria, from Mambilla Plateau (Ngel Nyaki forest), Obudu Plateau and Cross River National Park. In Cameroon, occurs at sea-level at Limbe (Victoria), uncommon on Mt Cameroon at 700–1280 m, fairly common on Mt Kupé at 760–1950 m, common to abundant on Mt Nlonako at 1200–1750 m and at Dikume Balue (Rumpi Hills) at 1000–1700 m, and quite common in Bali-Ngemba Forest Reserve at 1700–1800 m; known also from Bafeng, Ngaoundéré, Yoko, Yaoundé and Lolodorf. Single record in Gabon, at Mouila in 1984; at lower R Congo (S PRCongo and W DRCongo), not uncommon in Mayombe (Col de Bamba, Temvo, Makaia Ntete), inland to Thysville; in Angola, locally common in provinces of Zaïre, Cuanza Norte and Malanje (Bango), S to Gabela, in Cuanza Sul. In Sudan, recorded only in Imatong Mts, where uncommon at 2400 m. In E DRCongo, widespread from Arebi, in N, to Baraka, in S; common in Itombwe Highlands at 1170–1830 m, and near Baraka at 2200–2300 m. In Uganda, common in Bwindi Impenetrable Forest, elsewhere local and uncommon at 900–2500 m from Kibale S to Mabira and Malabigambo; also on Mt Elgon. In Rwanda, found at up to 2300 m in W Nyungwe Forest. In Kenya, confined to Kakamega and Nandi Forests, where uncommon; an old record from Kenyan side of Mt Elgon at 2400 m; reported also from Tugen Hills. In Tanzania, recorded at Minziro Forest Reserve, in NW, and at Mt Kungwe, in W. Reports of this species' presence in N Central African Republic (Manovo-Gounda Saint Floris National Park) require corroboration.

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14. Red-eyed Puffback

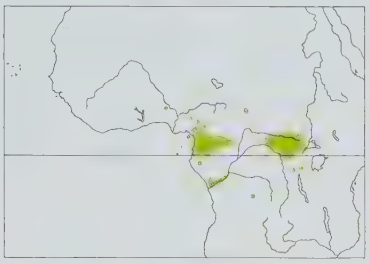
Dryoscopus senegalensis

French: Cubla aux yeux rouges **Spanish**: Cubla Senegalesa
German: Schwarzschulter-Schneeballwürger
Other common names: Black-shouldered Puffback

Taxonomy. *Sigelus senegalensis* Hartlaub, 1857, "Senegal"; probably = Gabon.
Forms a superspecies with *D. cubla*. Monotypic.

Distribution. From W & SE Nigeria very patchily S to NW & NE Angola, discontinuously E to N Central African Republic, NE DRCongo, W Uganda and Rwanda.

Descriptive notes. 16–18 cm; 23–34 g. Male has forehead to mantle, scapulars and upperwing black, glossed dark blue, back and rump white (plumage dense and capable of erection), uppertail-coverts glossy bluish-black, tail glossy black; entire underside white with cream wash (patchily greyish where dark grey feather bases show between white feather tips), chin with many filoplumes 5–8 mm long; underwing-coverts and axillaries white, underside of flight-feathers greyish-black; iris orange-red; bill black; legs grey. Distinguished from very similar *D. sabini* mainly by somewhat smaller size, shorter and less deep bill with less prominent hook at tip, and paler eyes. Female is like male, but has white stripe from nostril to above eye, lores black, upper cheek white (not



black), lower mantle, scapulars, wing and tail dark greyish-brown, back and rump smoky mid-grey, or mantle sometimes glossy black, rump sometimes white; 29 females examined, from R Dja (Cameroon) four have white rump and five have grey rump, from Efulen (Cameroon) three have white-and-grey rump and two grey rump, four from E DRCongo have white or pale grey rump, and eleven are intermediate, also two females from Kumba (Cameroon) have grey mantle and two have black mantle, most R Dja females have black mantle, most from Victoria (Cameroon) have grey mantle, others are intermediate. Juvenile male (almost fully fledged) is like adult male in colour, but plumage fluffy; immature male seems to be exactly like adult female. Voice. Vocal, but keeps hidden. Male's song a rolling snore lasting up to 2 seconds, beginning with tearing sound, loudest in middle and then dying away, "tzzzzrrrree-eeawrrrrr", or ending with single "jit" (possibly given by a second individual); female sometimes joins in with snapping and scolding notes, "chrraaay", or with softer, rasping notes like those of a *Ploceus* weaver, "tsap-tsap-tsap-tsap". Another male song is shorter, upslurred "djit-djurrreeee" or "djit-jijurrreeeeya". Male's territorial call, from perch and in flight, a loud, explosive "kyow", "chyow" or "ptiou", frequently repeated, or monotonous "chew-chew-chew..." or "tzew-tzew-tzew..."; the loud "chyow", high-pitched and downslurred, can be repeated on same pitch up to 20 times, at rate of 2 notes per second; also utters fast, dry, harsh rattle or ratchet-like note, and loud clicking "tik-tik-tik-tik...". Makes wing-fripping sounds in flight.

Habitat. Inhabits secondary forest, large thickets, forest clearings and gallery forests; less common in very open forest; keeps chiefly in canopy of tall, isolated trees, also in smaller trees in old clearings. At M'Passa, in Gabon, commonest in thin woods with open spaces and in isolated trees left in clearings; also in cacao and avocado (*Persea americana*) plantations, and in clearings in primary forest, although not in primary forest itself. In Lopé National Park, also in Gabon, inhabits gallery forest and small forest patches; penetrates primary forest, but only a short distance from edge.

Food and Feeding. Prey includes beetles (Coleoptera), bugs (Hemiptera), orthopterans and their eggs, dictyopterans, termites (Isoptera), large caterpillars, a spider (Araneae) and a tiny frog. Occupies mainly middle and upper levels of vegetation, but sometimes lower levels at forest edge; forages 10–25 m above ground, sometimes higher, rarely lower. Occasionally flies up to hawk a flying insect. Occurs in pairs and in family parties of three or four individuals; often in mixed-species flocks.

Breeding. Season Feb, Aug and Nov in Cameroon and Dec–Mar in Gabon; in breeding condition throughout year and nestling found in Sept in NE DRCongo; breeding condition Jul–Sept and Nov in Uganda. Strongly territorial; male regularly traverses territory in canopy, fripping wings and singing as he flies from tree to tree, quite often raising puff of white rump feathers, aggressive towards *Malaconotus bocagei* in its territory. Such flights serve also as courtship, and occur during nest construction and incubation stages. Nest built by female, accompanied by displaying male, a small, compact cup made of fine rootlets and vegetable fibres held together with spider web, externally covered uniformly and entirely with pieces of lichen; placed 4–16 m above ground on multiple horizontal fork in middle of or near end of branch. One clutch was of 2 eggs; incubation by female only, period 16 days; chicks brooded by female, male passes food items to her for delivery to young, chicks fed also by both parents during independent short nest visits; no information on duration of nestling period; fledglings remain with parents almost until the next nesting attempt.

Movements. Resident.

Status and Conservation. Not globally threatened. Rare to locally common. Density of 2–4 pairs/10 ha in N Gabon. Only three records from Nigeria, at Oshogbo and on Obudu Plateau. In Cameroon, very common at Kumba, frequent on Mt Kupé at 750–1300 m, abundant in Mbam-Djerem National Park, and record at Bali (Bamenda Highlands); widespread in S, and reported as abundant at Bonga in 1920s. In Gabon, widespread in N from R Ogooué (Ogobai) and R Moonda (Mondah) E at least to M'Passa, and throughout Lopé National Park; recorded at Mimongo, Kango, Cape Esterias and Mbigou, and frequent around Mouila. In PRCongo, common in more humid parts of Odzala National Park, common in Bomassa region of Nouabalé-Ndoki National Park, and widespread in Mayombe; frequent in Bamingui-Bangoran National Park, in Central African Republic. In DRCongo, widespread in NE (Uele), and possibly extends right across N part of country from NW (N PRCongo border); common in Ituri and Semliki, uncommon in Irangi Forst near Kahuzi-Biega National Park; occurs also W of Bukavu, and in SW DRCongo in region of lower Congo valley, downstream from Kwamouth. In Uganda, old records from Ruwenzoris and formerly not uncommon in Bwamba lowlands, but no recent records; pair seen in Shava Valley, in Rwanda. Not uncommon in Angola, where found in Cabinda and in N Lunda Norte (e.g. Dundo).

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15. Black-backed Puffback

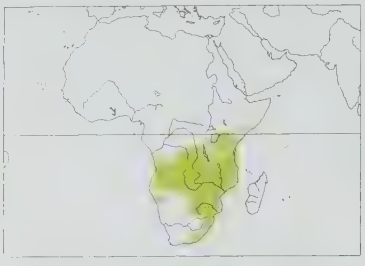
Dryoscopus cubla

French: Cubla boule-de-neige **Spanish**: Cubla Dorsinegra
German: Schwarzmantel-Schneeballwürger
Other common names: Southern Puffback, The Puffback; Zanzibar Puffback (*affinis*)

Taxonomy. *Lanius cubla* Latham, 1801, Cape of Good Hope, South Africa.
Forms a superspecies with *D. senegalensis*. Only "pure" individuals of race *affinis* seem to occur on Zanzibar and adjacent mainland coast; from coastal S Somalia S to C Tanzanian coast (Dar es Salaam) many are pure *affinis*, but others, especially inland, have variable amounts of white in scapulars and wing, and exhibit extensive intergradation with *nairobiensis* and *hamatus*. Race *okavangensis* intergrades with *hamatus*. Proposed race *chapini*, described from Newington (E Mpumalanga), in NE South Africa, is subsumed in *hamatus*. Five subspecies recognized.

Subspecies and Distribution.
D. c. hamatus Hartlaub, 1863 – N Angola, SE & E DRCongo, N & W Zambia, SW Kenya (W of Rift Valley, to Kavirondo Gulf), Tanzania (except NE), Malawi, Mozambique, E Zimbabwe, and

lowland NE South Africa (Limpopo Province S to extreme N & NE Free State and N KwaZulu-Natal) and Swaziland.
D. c. nairobiensis Rand, 1958 – E of Rift Valley in Kenya (S from Archer's Post, E to Mt Endau, Kibwezi, and Tiva and Voi rivers) and NE Tanzania (S to Kilosa, E to Usambara Mts).
D. c. affinis (G. R. Gray, 1837) – S Somalia and coastal lowlands of Kenya (extending inland to Bura and Shimba Hills) and Tanzania (S to R Rufiji), including Zanzibar I and Mafia I.
D. c. okavangensis Roberts, 1932 – S Angola, Zambia (S from Balovale) and W Zimbabwe S to N Namibia, N & E Botswana and N South Africa (R Molopo, in N North West Province).
D. c. cubla (Latham, 1801) – SE South Africa (S KwaZulu-Natal S along coast to E Western Cape).



Descriptive notes. 16–18 cm; male 19–36 g and female 21–30·5 g (nominate), male on average 6 g less and female 4 g less (*nairobiensis*), male on average 3 g and female 4·5 g heavier than nominate (*affinis*). Male nominate race has forehead to mantle, lores, narrow line under eye, ear-coverts and side of neck glossy bluish-black; back and rump white, feathers dense and quite long (capable of being fluffed up into hemispherical shape), uppertail-coverts and tail glossy black; flight-feathers black, edged white, narrowest on primaries, tertials broadly edged white, greater primary coverts black, narrowly edged and tipped white, all secondary coverts black, broadly edged and tipped white; throat and entire underparts creamy greyish-white; underwing-coverts and axillaries white, underside of flight-feathers shiny dark grey; iris bright red to orange-red to orange-yellow (colour appears to vary between habitats, e.g.orange-red in montane forest and red in woodland populations); bill black; legs grey. Female is like male, but less intensely black, with white areas creamy (rather than snowy), rump greyish and feathers shorter than male's; eyes bright orange or yellow-orange, upper mandible black, lower mandible blue-grey or pale grey for variable portion from base, legs blue-grey. Juvenile is like female, but feathers of upperparts blackish-grey with buff tips, rump grey-brown, chin to undertail-coverts initially fluffy and dull white, turning buff soon after young leaves nest; immature like adult female above, has throat, breast and usually belly orange-buff, finely vermiculated, eyes brown at first, becoming yellowish-orange, bill blackish-grey, paler below. Race *okavangensis* male is like nominate but white edges of wing feathers broader, underparts whiter, eyes red, female like nominate but feathers of forehead and mantle edged greyish, rump pure grey (rather than creamy) and lores pale buffy (not blackish); *humatus* male resembles previous but scapulars broadly edged white (large white shoulder patch) and underparts almost pure white, female like nominate but lores whitish; *nairobiensis* male has wings blacker than last (white edges of all feathers narrow) and white scapular patch less conspicuous, female with lores dusky (not whitish); *affinis* male is distinctive, has scapulars and wings all black, female almost or entirely without white in scapulars and wings and with lores dusky. Voice. Male song a percussive click followed by loud, clear whistle, "dzlit-toweeeyoo" or "tzr-t'weeeyo", sometimes second part pure and shrill, "zzt-wheee"; repeated up to ten times in c. 10 seconds; female often responds instantly in duet with tearing "chizzzrrrrr", loud "cheeerrrr" or nasal "wraanh"; sometimes female sings first and male responds in near-synchronous duet, "jeeeez-tweeeyu". Also whistles a repeated upslurred "tu-tu-wee" or downslurred, ringing "tywe-tyew-tyew". Courting male calls "chak-chak-chak" in flight; frips wings and clicks bill in flight. Many other calls, in variety of clicks, snores, chatters and whistles often in conversational medley, like a *Lanius* shrike.

Habitat. Canopy of dense savanna woods and forest edges, less commonly in sparse woodland; occasionally in open acacia (*Acacia*) savanna, especially where modified by bush encroachment. Inhabits also evergreen montane forest, dense riverbank woods, coastal forest and mangrove; in South Africa commonly in plantations of black wattle (*Acacia mearnsi*) and in well-wooded parks and gardens; in Tanzania in gardens and coffee plantations; in N Malawi tall submontane forest at 2000 m. Sea-level to 2200 m.

Food and Feeding. Eats beetles (Coleoptera), large numbers of caterpillars, ants (Formicidae), termites (Isoptera), also *Salvadora* fruits and *Acacia* buds. Food items given to nestlings include butterflies and moths (Lepidoptera), noctuid and saturnid moth caterpillars, long-horned grasshoppers and crickets (Orthoptera), dragonflies (Odonata), beetles, larvae, worms and small lizards; once a stick-insect (Phasmida) 115 mm long and from which legs had been removed. Forages mostly in upper canopy of trees, moving swiftly and silently in horizontal posture, gleaning from foliage and wood; explores galls and pods at end of branch while momentarily hanging upside-down; sometimes comes lower, and descends to the ground in pursuit of falling prey. Occasionally hawks for flying insects. Forages singly and in pairs. Commonly joins mixed-species foraging flocks, e.g. in Zambia found in 61% of bird parties in one area and 36% in another; in Serengeti National Park (Tanzania), often in parties including *Laniarius erythrogaster* and *Malaconotus blanchoti*.

Breeding. Fledglings in Oct in Somalia; in Kenya, season Jan–May, Jul, Sept–Oct and Dec (mainly Apr) inland, Sept and Dec near coast; Jan–Mar in N Tanzania and Jul–Dec on Zanzibar; birds with active gonads in Oct in Angola; breeds Jul–Dec and Mar (mainly Sept, then Oct–Nov) in Zambia; in all months except May (peak Sept–Nov) in Zimbabwe, Oct and Mar in Mozambique, and Feb and Oct–Nov in Botswana; in South Africa, mainly Sept–Jan (peak Nov–Jan) in Limpopo and Oct–Dec in KwaZulu-Natal; single brood per season. Monogamous; one pair remained together for four seasons. Territorial all year; male advertises and defends territory by calling repeatedly (up to 60 times) while perched in exposed position in upright posture on top of tree, with crest and throat feathers slightly raised, tail half-fanned; male signals territorial threat by counter-singing rapidly with whistles and tearing sounds, female joining in with scolding calls; in high-intensity interactions calling speeds up and rises in pitch, then male clicks bill stridently, often during descending, bouncy flight with wings whirring, head held up, tail fanned, and back and rump feathers fluffed out into dense snow-white hemisphere about size of golfball or small powder puff; on alighting, male crouches, with head and foreparts down, and sways slowly from side to side; female clicks bill and occasionally fluffs rump feathers. Male courtship display seems to be just the same as territorial display: short flights with bill-clicking, whirring wings, fanned tail and puffed-out rump; male chases female, pair flying with loud wing-fripping, bouncing swiftly through branches, then male approaches mate in head-down posture, swaying body, with tail fanned, and white rump puff so erect that it almost envelops slightly drooping wings, female bends down and partly opens wings, male mounts her. Nest built by female alone (see page 76), male sometimes brings material, work takes about ten days; a small, neat, deep cup made of dry grass, roots and thin strips of bark, bound with spider web and some plant down, sometimes decorated on outside with pieces of lichen, dry leaves and bark, and lined with fine wiry dry grass; well hidden in upright fork 2–15 m above ground in tree; territory size c. 4 ha in dense lowland woods; on Nyika Plateau (Malawi) at 2000 m pairs occupy all forest patches of 7·5 ha or more and at Zovotchipolo (2200 m) two forests of 8·5 ha and 12 ha each held one pair. Clutch 2–4 eggs, in Zambia generally 3–4; incubation mainly by female, fed on nest by male, male relieves her for short periods (both sexes initiate nest-relief, by calling), period 13 days; chicks brooded by female, she feeds them with food delivered to her by male, later fed by both parents, both also remove faecal sacs, nestling period c. 18 days; young out of nest continue to beg from and are fed by parents for at least three weeks, and juveniles appear to be tolerated in parental territory until next nesting season; up to 15 individuals, all or most juveniles, sometimes congregate noisily in trees, displaying rump feathers, calling, wing-fripping and chasing. Nests occasionally parasitized by Klaas's Cuckoo (*Chrysococcyx klaas*), and possibly by African Emerald Cuckoo (*Chrysococcyx cupreus*) and Black Cuckoo (*Cuculus clamosus*). Nestlings sometimes killed by ants. Individual ringed as adult survived for further 10 years 8 months.

Movements. Resident; ringing recoveries all within 10 km of ringing site.

Status and Conservation. Not globally threatened. Generally common. In Somalia, fairly common in lower Jubba and lower Shabeelle valleys and in extreme S; frequent to common in Kenya, where widespread from sea-level up to 2200 m, almost entirely S of equator. In Tanzania, seemingly local in W half, including Minziro Forest (in NW), Zinza area (S of L Victoria), mesic woodlands near L Tanganyika, and probably much of Kigoma and Tabora provinces; widespread in E half, including on Zanzibar and Mafia I. Widespread in SE DRCongo S from S Kivu and E from Kasai, and common and widespread throughout Zambia, Zimbabwe, Malawi and Mozambique. Common in much of Angola, but absent from NW & SW; frequent to common in N Namibia, N & E Botswana, most of NE & E South Africa and throughout Swaziland.

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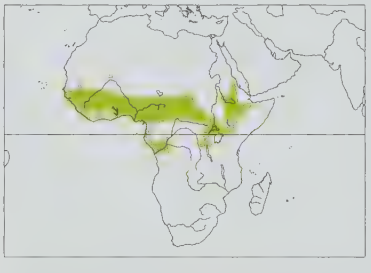
16. Northern Puffback

Dryoscopus gambensis

French: Cubla de Gambie **German**: Gambia-Schneeballwürger **Spanish**: Cubla del Gambia
Other common names: The Puffback, Common/Gambian Puffback/Puffback-Shrike

Taxonomy. *Lanius gambensis* M. H. C. Lichtenstein, 1823, Senegambia.
Considered to form a superspecies with *D. pringlii*, the two being very alike in plumage and having parapatric ranges (some sympatry in S Ethiopia). In E range, size decreases clinally from N (Sudan) to S (Itombwe); race *erwini* rather poorly differentiated, sometimes subsumed in *malzacii*. Five subspecies recognized.

Subspecies and Distribution.
D. g. gambensis (M. H. C. Lichtenstein, 1823) – extreme S Mauritania and Senegambia E to W Cameroon and Gabon.
D. g. congicus Sharpe, 1901 – SW PRCongo, SW DRCongo and NW Angola (Cabinda).
D. g. malzacii (Heuglin, 1870) – E Cameroon, S Chad, Central African Republic, SW Sudan, NE DRCongo, Uganda, W Kenya, Rwanda, N Burundi and NW Tanzania.
D. g. erythreae Neumann, 1899 – Eritrea, Ethiopia and E Sudan (Sennar).
D. g. erwini Sassi, 1923 – Itombwe, in E DRCongo.



Descriptive notes. 18–19 cm; male 30–37 g, female 25–40 g, male on average 2–2·5 g heavier than female (*malzacii* and *erwini* combined). Male nominate race has forehead, lores and narrow line under eye back to ear-coverts, hindneck, side of neck and mantle glossy bluish-black; back and rump greyish-white (plumage long, dense and erectile), uppertail-coverts and tail glossy black; primaries blackish-brown, narrowly edged pale grey, secondaries and tertials blackish-brown, edged and tipped greyish-white, greater primary coverts black, very narrowly pale-edged, secondary coverts brownish-black, broadly edged and tipped greyish or buffy white; entire underside creamy greyish-white; underside of flight-feathers shiny dark grey, underwing-coverts and axillaries white; iris bright orange or red; bill black; legs grey. Female has forehead, crown, upper cheek, ear-coverts, nape, hindneck and side of neck medium grey, upperparts greyish-brown, uppertail-coverts dark brown, tail brownish-black; flight-feathers dark brown, edged rufous, upperwing-coverts dark brown with grey bases, mainly fringed pale rufous or greyish-white; chin to breast and upper flanks pale creamy rufous, merging into white in middle of belly and vent, rest of underparts pale rufous, washed brownish; upper mandible black, lower mandible blue-grey or pale grey for variable portion from base, eyes bright orange, legs blue-grey. Juvenile is similar to immature, but chin and throat white, lower throat with cream wash; immature (both sexes) is like female, but mantle feathers tipped pale rufous, flight-feathers, scapulars and upperwing-coverts broadly fringed rufous, chin and throat rufous, underparts white, feathers fluffy, grey bases showing through patchily. Races differ mainly in plumage of females: *congicus* female is deeper rufous below and flanks more uniformly rufous than nominate; *malzacii* female has forehead, crown and hindneck very dark brown (not grey) and mantle and back dark brown (not greyish-brown), underparts slightly paler than nominate, and colour from chin to flanks and undertail-coverts more uniform; *erythreae* female is almost male-plumaged, but upperparts dark chocolate-brown where male bluish-black, and underparts usually creamier; *erwini* is smaller than nominate, and may differ from *malzacii* in bill colour (black in male, but proximally grey in female) and eye colour (orange-red in male, orange in female). Voice. No particular courtship or territorial song known, and pair-members do not sing in antiphonal duet. Contact and other calls include loud, explosive whistles, harsh rasping sounds, strident clicking; makes wing-fripping sounds. Main call a harsh whistle, single or double or repeated rather slowly: "tchrep-tchrep", "tyoop", "tyoo-yoo", "chip-chipchip" or "churc-churp…", and rasping "zhrraanh" or "zhiuu"; also slow, harsh "wrrich, wrrich", nasal "krim, krim", high-pitched querulous "weer-weer" interspersed with nasal disyllabic whistles; calls often accompanied by strident chattering and clicking; alarm a repeated, sharp "tuk, tak…" and (when bird held in hand) prolonged metallic trilling.

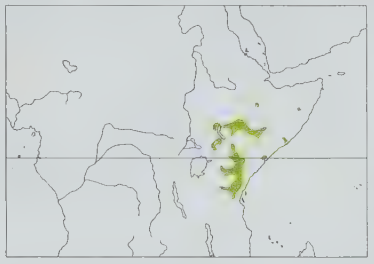
Habitat. Dense mesic savanna woodland, also thickets, mangroves, wooded farmland, bamboo groves and well-timbered gardens. In Liberia, forest–grassland mosaic to 1500 m altitude, and secondary growth, forest edge and mangrove on and near coast; in Nigeria favours shea-butter trees (*Vitellaria paradoxa* = *Butyrospermum parkii*); in Eritrea lives at up to 1540 m in wet woodlands, *Combretum*, and riparian figs (*Ficus*) and tamarinds (*Tamarindus*), but never in pure acacia (*Acacia*) woods. Lowlands in W Africa; highlands to 3000 m altitude in E Africa.
Food and Feeding. Insects, including beetles (Coleoptera), Lepidoptera (including caterpillars) and Orthoptera; a few plant buds. Keeps in tree canopy, moving rapidly but stealthily among the branches, descending to tops of tall undergrowth; pulls appendages (moth wings and orthopteran legs) from insect prey before consuming them. Forages singly and in pairs; retiring, secretive and easily overlooked.
Breeding. Poorly known. Season Aug in Mauritania and Jun–Sept and Dec in Gambia; in Liberia, males display in Sept–Oct and Mar–Apr; breeds Apr–May and probably later in Ghana, about May–Jul in Togo, and apparently Apr–Jun, Sept–Oct and Dec in Nigeria; Apr in Ethiopia, Jan in Kenya, and Apr, Aug and Oct in E DRCongo (Itombwe); in breeding condition in Mar–Oct and Dec–Jan in Uganda. Appears to be monogamous and territorial. In courtship very vocal and demonstrative, male flies from tree to tree, with white back and rump feathers puffed out to cover back and base of wings. Nest a compact cup made mainly of fine strips of bark, the outside plastered with spider web, lined with fine rootlets or with very fine bark strips and plant down, placed c. 20 m above ground in multiple fork of tree. Clutch 2–3 eggs. No other information.
Movements. Resident; suggestion of migration through Gabon.
Status and Conservation. Not globally threatened. Frequent to common in N tropical woodlands, ranging N to upper Guidimaka valley in S Mauritania, great bend of R Niger in Mali (where scarce), W National Park in Niger, Abéché in Chad, Jebel Marra foothills in W Sudan and Blue Nile valley to about Singa in E Sudan, and highlands to about Asmara in Eritrea. Ranges S in W Africa to N limits of rainforest zone. Density of 10–12 birds/km² in Chilomo Forest, in Ethiopia. In Somalia, several records at Ged Deeble (in NW) in 1918 and 1958. Scarce in Mbini and Gabon (M'Passa, Lékoni, Mouila and Tchibanga); in PRCongo, rare in Odzala National Park but widespread S from Léfini; in Angola found only in Cabinda, where not uncommon, but an old nest record from N'dalatando. In DRCongo, common in N Uele, sparse in Ituri and Kivu, frequent in lowlands in Semliki valley and to 2150 m in Ruwenzoris and 3000 m on Kivu Volcanoes, and quite common in Itombwe Highlands at 1850–2830 m; widespread to at least 2000 m throughout Uganda, except for area S of Masaka and E of Mbarara; in Kenya, frequent to common at 900–2200 m, near Moyale and from Marsabit, Mt Nyiru, Mt Loima, Horr Valley, Cheranganis, Kapenguria and Elgon S to Bondo, Ng'iya, Nandi, Elmenteita, Lake Nakuru National Park and Laikipia Plateau, E to N Uaso Nyiro valley. In NW Tanzania recorded from Ngara (near Rwanda) and Kibondo (near Burundi); in Rwanda from Zaïre-Nil crest at 1700–2600 m and Kibungu region (in SE) at 1300–1750 m; records in N Burundi. Threats to this species are characterized by those facing the avifauna of the Hwimo area of W Nigeria, where, as a result of increasing human population, new land is continually being taken for farming and house-building; trees are systematically felled and burnt, and hunting is widespread, farmers carrying home-made guns and children wielding catapults. Corpses of this bush-shrike are commonly present in traditional medicine markets in Benin.
Bibliography. Adjakpa *et al.* (2002), Archer & Godman (1961), Ash & Atkins (2009), Ash & Miskell (1983, 1998), Balança & de Visscher (1997), Bannerman (1939a, 1953), Barlow *et al.* (1997), Bates (1930), Benson (1946a, 1948), Blake *et al.* (1990), de Bont (2002), Borrow & Demey (2001), Brosset & Érard (1986), Brown & Britton (1980), Button (1967), Carswell *et al.* (2005), Cave & Macdonald (1955), Chapin (1954), Claffey (1995), Clarke (1985), Colston & Curry-Lindahl (1986), Crick & Marshall (1981), Crisler *et al.* (2003), Dean (2000b), Dean *et al.* (2003), Desfayes (1975), Dowsett (1990), Dowsett & Dowsett-Lemaire (1993, 1997), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire (1990, 1997a, 1997c), Dowsett-Lemaire & Dowsett (2005), Elgood *et al.* (1994), Fishpool & Evans (2001), Friedmann (1937), Friedmann & Stager (1969), Fry (1970), Fry *et al.* (2000), Fuchs *et al.* (2005), Gatter (1997), Greig-Smith & Davidson (1977), Grimes (1978, 1987), Gronvik (1934), Hall & Moreau (1970), Harris & Franklin (2000), Jackson & Sclater (1938), Lippens & Wille (1976), Mackworth-Praed & Grant (1960, 1973), Malzy (1962), Morel & Morel (1982, 1988), Nguembock *et al.* (2008), Nikolaus (1987, 1989), Prigogine (1971), Quantrill & Quantrill (1998), Rand (1951), Rodwell (1996), Salewski (2000), Sauvage & Rodwell (1998), Schouteden (1969), Serle (1957), Serle & Morel (1977), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), van Someren (1916), Stevenson & Fanshawe (2002), Tadesse *et al.* (2001), Thiollay (1985), Urban & Brown (1971), White (1962), Young (1946), Zimmerman *et al.* (1996), Zinner (2001).

17. Pringle's Puffback

Dryoscopus pringlii

French: Cubla de Pringle **German**: Zwerg-Schneeballwürger **Spanish**: Cubla de Pringle

Taxonomy. *Dryoscopus pringlii* F. J. Jackson, 1893, Mauungu Wilderness and between Tsavo and Kufumika Road, Kenya.
Considered to form a superspecies with *D. gambensis*, the two being very alike in plumage and having parapatric ranges (some sympatry in S Ethiopia). Birds of this species in Ethiopia, having greyer underparts, may represent a distinct race; further study required. Currently treated as monotypic.
Distribution. S & E Ethiopia, C & S Somalia, NW, NE & C to SE Kenya and NE Tanzania.



Descriptive notes. 13·5–14 cm; male 19–22·5 g, female 13–20·5 g. Male has forehead and lores back to hindneck, side of neck, mantle and scapulars glossy bluish-black, back medium grey, rump whitish, uppertail-coverts glossy black; tail black, tips of feathers T2–T5 greyish-white, outermost rectrix with greyish-white tip and outer edge (2 mm deep); upperwing dark brown, primaries with narrow grey-buff outer edges, inner secondaries and tertials with whitish outer edges and tips, greater primary coverts with narrow white or whitish edges, greater and median secondary coverts with broader (1–2 mm wide) white or whitish edges and tips; chin and throat creamy or greyish-white, grading into pale grey on breast and pale brownish-grey on flanks; belly white (at least in middle), thighs grey, vent and undertail-coverts whitish; underside of flight-feathers shiny grey, underwing-coverts and axillaries white; underside of tail grey, feathers fringed whitish; iris dark red; bill black, basal half of lower mandible pale horn; legs grey-black. Female is rather nondescript, being greyish-brown above, lores and cheeks buffy whitish, narrow white ring around eye, rump whitish (when brown feather tips displaced), tail uniformly brown, pale creamy or greyish-buff below, grading to white on belly and undertail-coverts, with thighs pale brown; upper mandible black, lower mandible mostly or entirely whitish, legs blue-grey, soles pale greyish. Juvenile is like female but duller and buffier; immature like adult female, but head and mantle mottled brownish, eyes crimson, legs purplish. Voice. Poorly known. Song short, low-pitched, harsh and monotonous. Calls include rasping, nasal "cheee-tzrrrr", rapidly repeated "zitiitzitiitziiiit", and "chup-chup-chup"; repeated sharp "keu" often given by several birds together; and a low-pitched churr.
Habitat. Arid and semi-arid acacia (*Acacia*) and *Commiphora* scrub, bushland and woodland; lowlands, generally below 1000 m.
Food and Feeding. Insects, including caterpillars. Active gleaner in microphyllous foliage, moving through undergrowth or low trees; in Tsavo (Kenya), forages in woodland bushes, not trees, at average height of c. 2 m above ground. Often in mixed-species flocks.
Breeding. Little known. Laying recorded once in Nov in Kenya. Nest a deep, neat cup, one moulded on to horizontal branch and anchored to vertical twig c. 120 cm above ground in *Commiphora* sapling, another was basket-like, thin-walled, 7 cm wide and 6 cm deep, made of horizontal grass stems woven among vertical ones, turned inward at top to give neatly rounded lip, placed in multiple fork near top of a 2-m acacia bush. Clutch 2 or 3 eggs. No other information.
Movements. Apparently resident.
Status and Conservation. Not globally threatened. In Ethiopia very uncommon in S (in Yavello, Arero and elsewhere), with only five or six old records and twelve modern ones; old, isolated record near Kololo (C Ethiopia). Uncommon in Somalia, where eight old records and seven recent ones in S (S of 3° N), also an old isolated record N of Bacaadweyn (NC Somalia). Uncommon and local in Kenya, with small population SW of L Turkana (in upper Turkwell valley and Karasuk Hills), records from Moyale and Mandera, seven pre-1970 records along seasonal watercourses from about North Horr and W & SE of Marsabit to Kinya, N & S of Benane and near Adederata; main range from about Barsalinga and Archer's Post S to Meru National Park, Kora Nature Reserve, Kitui, Mtito Ande and Tsavo National Parks, and S into extreme NE Tanzania at L Jipe, Lembeni, Mkomazi Game Reserve and Usambara lowlands S to 4° 20' S; also isolated Tanzanian records from near Manyara and N of Morogoro. Scarcity of this species may be more apparent than real, and it is not considered to be at risk. Nonetheless, it would be prudent to discover much more about this bush-shrike as the basis for future conservation measures.
Bibliography. Ash & Atkins (2009), Ash & Miskell (1998), Bennun & Njoroge (1999), Benson (1946a), Brown & Britton (1980), Coburn (2008), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Fishpool & Evans (2001), Fry *et al.* (2000), Hall & Moreau (1970), Harris & Franklin (2000), Lack (1985), Lewis & Pomeroy (1989), Mackworth-Praed & Grant (1960), Moreau & Moreau (1939), Redman *et al.* (2009), Serle (1943a), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Stevenson & Fanshawe (2002), Tilahun *et al.* (1996), Urban & Brown (1971), White (1962), Zimmerman *et al.* (1996).



Genus *LANIARIUS* Vieillot, 1816

18. **Sooty Boubou**

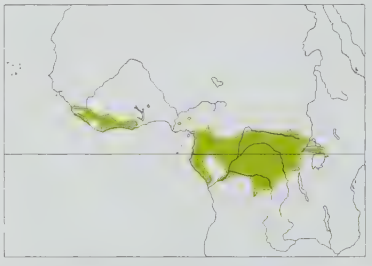
Laniarius leucorhynchus

French: Gonolek fuligineux **German**: Schwarzwürger **Spanish**: Bubú Sombrío

Taxonomy. *Telophonus leucorhynchus* Hartlaub, 1848, Elmina, Ghana.
Recent DNA analyses indicate that this species may be as closely related to the black-and-scarlet S African *L. atrococcineus* as it is to the similarly all-black low-latitude *L. poensis*, *L. fuelleborni* and *L. funebris*. Monotypic.

Distribution. Sierra Leone and SE Guinea E to SW Ghana and N Togo, and SE Nigeria E to extreme SW Sudan (Bengengai) and Uganda, S to extreme NW & NE Angola (Cabinda, N Lunda Norte) and C DRCongo.

Descriptive notes. 21–22 cm; male 51–57 g, female 44–45 g. Male is jet-black with faint violet or blue gloss; feathers of lower back and rump very full, long and soft; underside of primaries dark brown; iris dark red-brown or very dark red (DRCongo), or perhaps brown-black (W Africa); bill black; legs blackish or dark slaty bluish. Female is the same as male, but without gloss. Juvenile is like adult, but mantle to rump, wings and side of breast dark chocolate-brown with almost a maroon wash; immature like adult, but bill whitish to ivory-white, changing to adult black rather blotchily, and sometimes has very faint pale spots on crown. Voice. Sings often, all year; pair sings in duet,



which thought to serve for both contact and territorial proclamation, duetting frequency increasing when another pair in vicinity; singing or calling initiated by either sex and appears not to vary regionally (songs in S DRCongo just like those in Rwanda and Uganda). Male song low, hollow whistles, almost pure but with slight burry quality, quavering or ringing, varying from "ooooooooo" (1 second long) that starts and ends softly and becomes louder in middle, repeated after 1-second pause, to a series of four whistles, "oo-oo-woo-woo", the last two louder; a series of similar but shorter whistles at rate of two per second, either continuously or in groups of four; series of 10 notes, the last 7 faster than the initial 3, lasting c. 2 seconds, series repeated after 1-second pause; fast series of hollow whistles at rate of eight per second, either continuous or in groups of 11 notes separated by short gaps; fast "hohohohohoho..." series of up to 50 notes. Faster songs sound like song of White-spotted Flufftail (*Sarothrura pulchra*) in same forests. Male song sometimes answered by female, either synchronously or antiphonally, with low, harsh, scolding "skaaaa" or "hzzrrrrrit-hzzrrrrrit", or vibrating, trembling, hoarse "zzhrrrraaaaazzhrrrraaaaa" (like sound of cloth being slowly but forcibly torn), or drawn-out plaintive "hweeeew" whistle. Other vocalizations are a bubbling or gurgling "blopblopblop" or "blpblpblpblp" seemingly during foraging, also described as 9–10 low clicking "cli" notes; twanging, nasal "tzzaa-naa-naa-naaa" in territorial threat and courtship; sharp, harsh "tik" and "hoik" notes in alarm.

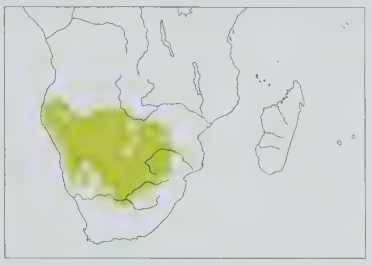
Habitat. Dense undergrowth near lowland rainforest and in savanna woodland, to 900 m in Liberia and 1400 m in Uganda. Impenetrable liana-covered tangles, rank vegetation, dense thickets and thick herbage in coastal shrubland, open swamp vegetation, thickets in mixed papyrus (*Cyperus papyrus*) marsh, low swamp-forest, riparian forest, wooded islands and banks of large rivers and lakes, bushy farmland, young secondary growth, forest clearings and edges, gallery forest and remnant stands of forest in savanna. Enters primary forest along borders of watercourses, old forest tracks, and where opened up by windfalls and storm damage; in *Cynometra* forests in Uganda.
Food and Feeding. Orthoptera, butterflies and caterpillars (Lepidoptera), mantises (Mantidae), cicadas (Cicadidae), beetles (Coleoptera), large wasps (Hymenoptera), ants (Formicidae), spiders (Araneae) and snails (Gastropoda). Forages close to ground or, occasionally, up to 15 m or more above it; secretive, keeping in thickest tangles, moving through them with ease in small jumps. Forages in pairs, and sometimes solitarily or in family parties.
Breeding. Nest-building in May in Guinea; birds in fresh plumage and extended singing in Aug–Nov, nest with eggs in late Oct, females with enlarged ovaries in Nov and Mar, and carrying nest material in Mar in Liberia; breeds Dec–Jan in Gabon; enlarged ovaries Mar and Nov in Cameroon, Feb, Jun and Aug in DRCongo, and Jul in Uganda. Territory thought to be defended by singing. Nest a quite large, loosely structured open cup on base of intertwined twigs, rootlets and dry, thin, woody climber stems or tendrils; placed on multiple vertical fork 2–3 m above ground in bush in forest clearing, in vegetation c. 1 m above water, in thick ornamental tree in middle of clearing, or in young secondary growth; territory seems to be as large as 6–8 ha. Clutch 2 eggs; incubation by female alone; no information on duration of incubation and nestling periods; young out of nest accompanied by both parents.
Movements. Resident.
Status and Conservation. Not globally threatened. Rare throughout much of W Africa, although locally frequent, probably overlooked; frequent or common in well-investigated parts of Congo Basin. In Guinea, uncommon around Ziama Massif and Mt Nimba; in Sierra Leone, several old records from R Little Scarcies and elsewhere W of 12° W, more recently only in SE quarter (W to Bo); in Liberia, not uncommon along coast and in interior from Lofa County and Nimba to Zwedru, and common at Ganta; not uncommon in Ivory Coast S from Yapo, Lamto and Béoumi. In Ghana, recorded regularly at Akropong (in Akwapim) and irregularly at Cape Coast, Kakum Forest, Kumasi (where formerly common) and Tafo; sight record at Fazao, in Togo. In Nigeria, not uncommon around Umuagwu, once five together near Bashu, and occurs in Cross River National Park. In Cameroon, rare in Korup National Park but farther E recorded from numerous localities in Bitye, Efulen, Olounou and Zoulabot areas; frequent N to Mbam-Djerem National Park. Records in Central African Republic in Bai Bakalonga and along R Babonga in Dzanga Reserve, in Lobaye Prefecture and Bangui area, and along R Mbomou valley at DRCongo border; in Sudan, known only from Bengengai. Widespread and common in Gabon except in S, where uncommon in Gamba area and rare in Moukalaba-Doudou National Park; in PRCongo, common in Nouabalé-Ndoki National Park, Odzala National Park and Léfini Réserve, locally common in Mayombe, but almost absent from Goumina and some other areas. Widespread and locally frequent in DRCongo, where very common around Niangara. In Uganda, locally common in Bwamba area, elsewhere in S only about six records; one collected in Kenya (Kaimosi Forest) in 1931, but no records since; status in Rwanda uncertain. In Angola, not uncommon in Cabinda and N Lunda Norte.
Bibliography. van den Akker (2003), Angehr *et al.* (2005), Ash (1990), Bannerman (1939a, 1951, 1953), Bates (1930), Bobo *et al.* (2006), Borrow & Demey (2001), Brosset & Érard (1986), Carswell *et al.* (2005), Chapin (1954), Cheke & Walsh (1996), Colston & Curry-Lindahl (1986), Dean (2000b), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire (1990, 1997a, 1997b, 1997c), Dowsett-Lemaire & Dowsett (1991, 1999, 2000), Elgood *et al.* (1994), Érard (1987), Field (1979), Fishpool & Evans (2001), Friedmann & Stager (1969), Fry *et al.* (2000), Gatter (1997), Germain & Cornet (1994), Green & Carroll (1991), Green & Rodewald (1996), Grimes (1987), Hall & Moreau (1970), Halleux (1994), Harris & Franklin (2000), Lewis & Pomeroy (1989), Lippens & Wille (1976), Louette (1981), Mackworth-Praed & Grant (1960, 1973), Marchant (1953), Nguembock *et al.* (2008), Nikolaus (1989), Prigogine (1971, 1984c), Rand (1951), Rand *et al.* (1959), Ripley & Bond (1979), Ripley & Heinrich (1966), Serle (1965), Serle & Morel (1977), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), van Someren (1916), Sonnenschein & Reyer (1984), Stevenson & Fanshawe (2002), Thiollay (1985), Thorpe (1972), Tomlinson (1950), Traylor (1963), White (1962), Young (1946), Zimmerman *et al.* (1996).

19. Crimson-breasted Shrike

Laniarius atrococcineus

French: Gonolek rouge et noir **German**: Rotbauchwürger **Spanish**: Bubú Pechirrojo
Other common names: Crimson-breasted Gonolek/Boubou, Burchell's/Black-and-crimson Gonolek

Taxonomy. *Lanius atrococcineus* Burchell, 1822, Spuigslang Fontein (confluence of Vaal and Orange Rivers), South Africa.
Multiple genetic studies indicate that this species represents a single, deep branch in phylogenetic tree of present genus, only very distantly related to the other scarlet bush-shrikes. Until recently was regarded as forming a superspecies with *L. barbarus*, *L. erythrogaster* and *L. mufumbiri*, and as being closest to and sometimes conspecific with *L. erythrogaster* (calls apparently identical, and responds to voice playback of latter). Monotypic.
Distribution. Kalahari Basin and adjoining hardveld regions: S Angola, SW Zambia and W & S Zimbabwe S to Namibia (except W & S: Namib and Karoo), Botswana (except parts of N & C) and N & C South Africa (N & C Limpopo Province S to N Northern Cape and NW Free State).
Descriptive notes. 22–23 cm; 40–56·5 g. Has lores matt black, forehead to hindneck and side of head, and upperparts, jet-black and strongly glossy (gloss bluish in some lights); back and rump plumage full, soft and fluffy, black with mainly concealed white blotches; uppertail rounded or slightly graduated, glossy black, outermost rectrix sometimes with white triangular mark up to 6 mm deep at tip; upperwing glossy black, long white stripe formed by white outer lesser coverts, most median coverts, inner three greater coverts (outer two all white, innermost one with white outer web and black inner web), and white outer edges (2–3 mm wide) on inner three secondaries; chin to flanks and undertail-coverts brilliant crimson-red (slightly paler in arid regions), sharply demarcated from black of side of head and neck, thighs black; underside of tail glossy black, underwing-coverts and axillaries black; iris dark violet or grey-brown with narrow pale violet ring; bill black, mouth black; legs black. Rare yellow morph has chin to flanks and undertail-coverts bright daffodil-yellow. Sexes alike. Juvenile has top of head and mantle blackish-brown with fine rufescent-buff bars, back, rump and lesser wing-coverts dark brown with broader pale bars (formed by buff feather tips), flight-feathers dark brown, median and greater wing-coverts buffy white with



dark brown subterminal bars, uppertail-coverts and tail black with narrow rufous tips, chin to breast evenly and finely barred with buff and blackish, belly and flanks evenly and more broadly barred likewise, undertail-coverts crimson; when moulting from juvenile to immature plumage, first belly and flanks become crimson, then centre of breast does so (leaving large brindled brown patches on sides of breast and in middle of lower breast and upper belly), then chin and throat and sides of breast and then entire underparts become crimson, except for thighs and small patch in middle of lower breast. Voice. Wide repertoire of loud, explosive, hollow, ringing whistles by male and harsh grating, snarling or tearing sounds by female, usually in duet delivered at remarkable speed. Male territorial call, given solo or in duet, a high-pitched, explosive "quipquip" whistle given twice; duetting female intervenes instantly with harsh, scratchy "tzui" or "tjerr", the pair producing what sounds like a single song, "quipquip-tzui-quipquip"; antiphonal song can also sound like "pyop-zulwi-pyop", "weeyu-jaweer-weeyu" and "cho-zer-chop"; male can intervene in double female call, "jawaaa-beeyu-jawaaa" or each sex alternates without discernible pause, "beeyu-jawaaa-beeyu-jawaaa" or "tyotyo-ziluwaa-tyotyo-ziluwaa"; sometimes male and female calls are synchronous, when sound defies transliteration; single bird can utter complete duet sequence after losing mate. Other calls are a pure, high-pitched, 3-note whistle, "pee, yee, yoo"; male's ringing trill "torrrr" answered by female's grating "djuzhu", or male's dry "tirrrrr" answered by tearing "zaaaa"; alarm signalled with hard "qwip", and when ground predator or perched hawk nearby a slowly repeated harsh "tik tik..."; short-range contact call a soft, low-pitched churring; distant contact maintained by duetting; male invariably gives one or more soft "chop" notes just before leaving roost, female responding with "tsui" in duet. Breeding birds silent during nest-building and incubation; calling and duetting resume after eggs hatch, some pairs then much more vocal than others.
Habitat. Thornveld with scattered clumps of small trees, particularly woodland dominated by acacia (*Acacia*) and *Baikiaea*; keeps to densest vegetation.
Food and Feeding. Beetles (of families Carabidae, Tenebrionidae and Cerambycidae), beetle larvae, ants (Formicidae), caterpillars, termites (Isoptera), heteropteran bugs, spiders (Araneae); some small fruits and seeds also taken, and once birdtable peanuts husked and broken into small pieces. Ants a favourite prey when bird feeding on ground. Young fed with small moths (Lepidoptera), grubs, and once a 50-mm centipede (Chilopoda). Forages among branches and foliage but mainly on tree trunks, hopping around, inspecting rough bark and peering under loose pieces of bark; zigzags up through bush, bouncing rapidly from branch to branch; commonly comes to ground, where hops with very upright posture, wingtips pointing down and tail horizontal and jerking up at each bounce; sometimes runs. Flicks aside bits of vegetable matter in manner of a *Turdus* thrush; occasionally flycatches. Once seen to attack a bat (Chiroptera), dislodging it from behind bark; in captivity, kills other small birds. Often forages alongside *L. aethiopicus*, sometimes in same bush. Pair invariably joins flock of Southern Pied Babblers (*Turdoides bicolor*) passing through its territory and forages opportunistically with them; forages also with Arrow-marked Babblers (*Turdoides jardineii*), with Hoopoes (*Upupa epops*) on ground and with Common Scimitarbills (*Rhinopomastus cyanomelas*) low in trees.
Breeding. Season Sept–Apr, mainly Oct–Nov; often double-brooded, and some pairs make four nesting attempts in a season. Territory occupied all year, male advertises and defends it by singing from crown of thorn tree; territorial pairs counter-sing, and interact with excited body-bowing, side-to-side movements and tail-jerking, rivals sometimes counter-singing across territorial boundary for several minutes; once two opponents jerked tail up and down and then flew and struck each other's breast; breeding pair generally co-exists peacefully with other small birds, but will occasionally harass a pair of weavers (Ploceidae), paradise-flycatchers (*Terpsiphone*) or barbets (Capitonidae). Courtship involves some chasing of female by male in tree, bouncing and zigzagging through branches in tandem, tails jerking with each bounce; male also pursues female in flight, wings making fripping sounds, or male glides briefly with head held up. Nest built by both sexes, work usually taking five days, a rather untidy, poorly bound, quite bulky but weak open cup (trampled into flat platform by time young ready to leave), made largely of shreds of fibrous bark from branches and trunks of acacia trees, strips (some up to 25 cm long) added to nest by each bird in turn, lined with rootlets, dry shreds of weed stalks and strips from maize leaf, base of nest secured to substrate with spider web, most nests built in fork c. 3 m up in *Acacia karroo* tree; territory 2·4–7 ha in one study, mean 12 ha in another, usually surrounded by natural boundaries (e.g. open thicket surrounded by grassland). Clutch 2–3 eggs, average 2·8; incubation from first, second or third egg, period c. 16·5 days; chicks brooded and fed by both parents, brooded continuously for 5 days, no longer brooded at 11 days (even during rain), nestling period 18·5–19·5 days; 28 days after leaving nest fledglings still keep close to parents but forage independently, and are remarkably quiet and unobtrusive; roost in same tree as parents, family-members all sleeping in different places in tree. Nests heavily parasitized by Black Cuckoo (*Cuculus clamosus*). Breeding success variable, often poor: in brood of three, two chicks often die in nest, once because of infection by mites (*Ornithonyssus bursa*); in one study only seven broods fledged from 66 clutches, and in Nylsvlei (Limpopo Province, in South Africa) only one young fledged from 13 clutches; inexplicably, half of nests destroyed by their owners, before or after eggs laid. Longevity moderate: ringed juvenile recovered after 8 years 3 months.
Movements. Resident; some local wandering in austral winter.
Status and Conservation. Not globally threatened. Frequent nearly everywhere in range, commonest in well-developed acacia woodland and bushveld and in NW part of C Kalahari; absent from apparently suitable thornveld habitat in N lowveld of South Africa. Yellow morph rare: seen only twice in Zimbabwe and once in Botswana. Densities in former Transvaal (South Africa) of 1 pair/4–5 ha in optimal habitat and 1 pair/9–12·5 ha in suboptimal habitat. In Botswana, 2 birds/10 ha in E and 1 bird/ha in Okavango; in one year when region was drought-stricken, only one quarter as many birds as in previous year after good rains.
Bibliography. Benson *et al.* (1971), Borello (1988), Brewster (2004), Clancey (1952, 1980a), Dean (2000b), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Earlé & Grobler (1987), Fishpool & Evans (2001), Fry *et al.* (1988, 2000), Ginn *et al.* (1989), Hall & Moreau (1970), Harris & Arnott (1988), Harris & Franklin (2000), Harrison *et al.* (1997), Herremans (1995, 2004), Hockey *et al.* (1989), Hustler (2003), Irwin (1981), Jensen & Clinning (1974), Joubert & English (1973), Kopij (2005), Leisler & Winkler (2001), Leonard, Beel & van Daele (2001), Mackworth-Praed & Grant (1963), Maclean (1993), Merkle (2006), Nguembock *et al.* (2008), Oschadleus

On following pages: 20. Mountain Boubou (*Laniarius poensis*); 21. Fülleborn's Boubou (*Laniarius fuelleborni*); 22. Slate-coloured Boubou (*Laniarius funebris*); 23. Lühder's Bush-shrike (*Laniarius luehderi*); 24. Braun's Bush-shrike (*Laniarius brauni*); 25. Gabela Bush-shrike (*Laniarius amboimensis*); 26. Red-naped Bush-shrike (*Laniarius ruficeps*).

(2003), Priest (1948), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Sinclair & Sinclair (1995), Skinner (1996), Smithers (1964), Sonnenschein & Reyer (1984), Steyn (1996), Tarboton (1971, 1998, 2001), Traylor (1963, 1965), Tyler & Brewster (2000), Tyler & Tyler (1996), White (1962).

20. Mountain Boubou

Laniarius poensis

French: Gonolek de montagne **German**: Rabenwürger **Spanish**: Bubú Montano
Other common names: Mountain Sooty Boubou

Taxonomy. *Dryoscopus poensis* Alexander, 1903, Mount St Ysabel, Bioko.
Has often been treated as conspecific with *L. fuelleborni*, but the two differ in plumage (particularly of juvenile), in bill size and vocally. Recent genetic studies strongly suggest that the two, although more closely allied to each other than to the other black boubous (*L. leucorhynchus* and *L. funebris*), are not conspecific and do not form a superspecies. Considerable vocal differences between E race *holomelas* and W races (nominate and *camerunensis*) suggest that former may be better treated as a separate species. Three subspecies currently recognized.
Subspecies and Distribution.
L. p. camerunensis Eisentraut, 1968 – extreme SE Nigeria and W Cameroon.
L. p. poensis (Alexander, 1903) – Bioko I (Fernando Póo).
L. p. holomelas (F. J. Jackson, 1906) – NE & E DRCongo, W Uganda, W Rwanda abd NW Burundi.



Descriptive notes. 18 cm; male 39–49 g, female 30–36 g, unsexed 40–54 g (*camerunensis*), male 38–45 g and female 38–47 g (nominate). Nominate race is entirely dark glossy black with blue reflections; wing strongly decurved at tip, tail somewhat decurved at tip; iris bluish-black; bill and legs black. Sexes alike in plumage, male on average longer-winged and longer-tailed than female. Immature has upperparts dull black, without blue or violet gloss, and underparts matt black. Race *camerunensis* is like nominate in plumage, but larger; *holomelas* is like previous, but less glossy. Voice. Noisy, repertoire varied in each region, and main calls and songs differ substantially between regions; variety of whistles, harsh tearing and rattling sounds uttered generally in duet. Lacks liquid, rhythmic song of *L. fuelleborni*. Nominate race poorly known: duet consists of "vuik" (attributed to male), immediately followed by "eng" (attributed to female). Race *camerunensis* exhibits much individual variation, with loud whistles, trilling, snoring, clicking and rattling noises, squeals and harsh, grating alarm calls, and duets; commonest duet a grating "whaa-dzu" or "shaaaaa-tsu" by male followed, often instantly, by female's harsh, tearing "tzzzeeerrr"; male may respond with another "whaa-dzu", pair thus producing a three-component song. Male commonly gives "whoo-ee, wee, wit" whistle or repeated short whistles, "wok-wok-wok-wik-wik-wik", or faster "bu-bu-bu" or even faster, bubbling "bobobobo". Duets can be short, a rapidly repeated, abrupt, buzzy "hzz" and nondescript "eng" sound; also a harsh "chik-a-chaka, tk-a-tk, kcher kcher..." sequence; pair (or possibly single bird) utters 1·5-second tearing "whaaa-chuaaaoow"; single calls include "whazzz", longer, nasal "zzhaannh", hard "ckickit-ckickit"; also a repeated nasal, downslurred "jeeoonh..." and a short (0·5 seconds) hollow trill. Commonest vocalization of race *holomelas* a loud, ringing, high-pitched whistle, "heeeeeee", lasting 0·8 seconds, or ascending "hooeeee", given solo or as part of duet, answered by harsh "ti-haarwet" or snoring, rattling "korrrrr" or tearing "tzweeeerrr" by presumed female; also grating, frog-like "t'rrraaanh" answered by short "chyow", and "t'zzheeeh" answered by abrupt "chya"; other calls a tearing "turrrraaaanh" (1·5–2 seconds), scraping "jaaa" and hollow "jowjowjowjow"; in courtship or territorial threat a nasal twanging "zzazanananana"; in alarm a rasping scold; nestling has insect-like begging call.
Habitat. Edges of primary montane forest, dense low shrubby vegetation on steep slopes and in treefall areas, gallery forest and bamboos; at 600–2200 m in Cameroon, and to 3385 m in DRCongo. Occurs alongside *L. leucorhynchus*, at least seasonally, at 430 m on Mt Cameroon.
Food and Feeding. Insects, including beetles (Coleoptera), grasshoppers (Orthoptera) and caterpillars; occasionally snails (Gastropoda), isopod crustaceans and small frogs. Generally in twos, which are not necessarily male and female, often joining mixed-species foraging flocks; follows hunting swarms of *Dorylus* ants on forest floor. Skulks in deepest shade in thickest tangles of leafy, woody vegetation; occasionally comes into view for no more than a few seconds at a time. Forages low down in thick undergrowth and tangled vines and giant ferns; in Cameroon keeps lower in vegetation than *L. atroflavus*, but in Itombwe (DRCongo) sometimes ascends to middle levels of forest.
Breeding. Little known. Season Nov–Jan and Mar (and in breeding condition Oct and Apr) in Cameroon; bird with brood patch in Oct in Uganda; breeds Apr–May or probably Apr–Jul in DRCongo (Itombwe). Only one nest described, a mossy cup built in a cypress tree (Cupressaceae) covered with *Gouania* creepers; clutch 2 eggs. No other information.
Movements. Resident, or perhaps a small-scale vertical migant. Recorded down to 430 m at Ekona (Mt Cameroon), suggesting post-breeding descent.
Status and Conservation. Not globally threatened. Generally common and vocal, but very poorly known. In Nigeria, common on Obudu and Mambilla Plateaux and known from Gotel Mts. In Cameroon, abundant on Mt Cameroon at 700–1400, common at 1400–1950 m, and uncommon at 600–700 m (but once abundant at 500 m); abundant at Dikome Balue (in Rumpi Hills) at 1000–1700 m, on Mt Kupé at 1200–2000 m (recorded down to 950 m), on Mt Nlonako at 1200–1750 m; common on Mt Manenguba at 2100–2200 m, and occurs at 2200 m on Mt Oku, in Bamenda Highlands. On Bioko I, common at Pico Basilé at 1200–2100 m, with most records at 1500–1800 m, and in S highlands at 750–1800 m. In DRCongo, found in mountains from W of Mahagi and Kasenye (L Albert) S to Mt Kabobo; common in Itombwe Highlands at 1170–2450 m and on Mt Kabobo, uncommon on Idjwi I (L Kivu). In Uganda, quite common in Bwindi Impenetrable Forest; in Ruwenzoris uncommon at 2100 m, common at 2400 m and 3000 m, very common at 2700 m. In Nyungwe highlands, in Rwanda, commoner above 1950 m than below that level.
Bibliography. Ash *et al.* (1989), Bannerman (1939a, 1953), Borrow & Demey (2001), Bowden (2001), Brown & Britton (1980), Chapin (1954), Chappuis (2000), Dehn & Christiansen (2001), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire (1990), Dowsett-Lemaire & Dowsett (1989, 1990), Eisentraut (1956, 1963, 1968, 1973), Elgood *et al.* (1994), Fishpool & Evans (2001), Fotso (2001), Fry *et al.* (2000), Gyldenstolpe (1924), Hall & Moreau (1970), Harris & Franklin (2000), Jackson & Sclater (1938), Kizungu *et al.* (2002), Leisler & Winkler (2001), Lippens & Wille (1976), Mackworth-Praed & Grant (1960, 1973), Nguembock *et al.* (2008), Prigogine (1953a, 1971, 1980, 1984c), Rodewald *et al.* (1994), Schouteden (1969), Serle (1950), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Stevenson & Fanshawe (2002), Stuart (1986), White (1962), Willis (1983b).

21. Fülleborn's Boubou

Laniarius fuelleborni

French: Gonolek de Fülleborn **German**: Fülleborn würger **Spanish**: Bubú de Fülleborn
Other common names: (Fülleborn's) Black Boubou, Sooty Boubou(!)

Taxonomy. *Dryoscopus fülleborni* Reichenow, 1900, Usafua, north of Lake Nyasa, south Tanzania.
Has often been treated as conspecific with *L. poensis*, but the two differ in plumage (particularly of juvenile), in bill size and vocally. Recent genetic studies strongly suggest that the two, although more closely allied to each other than to the other black boubous (*L. leucorhynchus* and *L. funebris*), are not conspecific and do not form a superspecies. Slightly smaller and slatier-coloured birds from Uluguru Mts described as race *ulugurensis*, but seem barely distinguishable from *usambaricus*. Two subspecies recognized.
Subspecies and Distribution.
L. f. usambaricus Rand, 1957 – Eastern Arc mountains (Usambaras, Ngurus, Ukagurus, Ulugurus), in Tanzania.
L. f. fuelleborni (Reichenow, 1900) – Tanzania S of Uluguru Mts, N Malawi and extreme E Zambia (Nyika Plateau).



Descriptive notes. 18–20 cm; male 46–53 g, female 43–47 g, unsexed 37–53 g. Male nominate race is mostly greyish-black with variable bluish cast, rump plumage very full and soft; upperwing glossy brownish-black, primaries rounded and markedly decurved; iris dark brown; bill and legs black. Female is like male but slightly olive-washed, with dark blackish-grey belly. Juvenile is very dark olivaceous grey-brown above, wings and tail browner, dark greyish-olive below, with yellowish wash on belly and obscure dark olive banding; immature like juvenile, but without barring on belly. Race *usambaricus* is darker than nominate, male black with bluish-grey bloom (particularly on back, rump and belly), glossy jet-black ear-coverts and tail, glossy brownish-black wings, female and immature like male but head less blackish, whole plumage slightly greyer, underparts with faint olivaceous or ochreous wash, also female appears to be considerably shorter-winged than male. Voice. Very vocal, with varied repertoire of rattles, scolds, fluty whistles, grunts and trills. Male and female frequently sing in duet, initiated by either, male uttering loud, liquid, ringing whistles and female rattling trills; male also may sing alone, a descending "whee-whee-whee" or "fweet-fweet-fweet" or somewhat explosive "dududwee" or "to-wheee, to-wheee" or "pu-wheeeng" ending with upslurred note, or repeated "co-wo-roik"; female's trill a rattling "tyurrrrrrrrr..." or "p-r-r-r-r-r-r...", rising sharply at first and then descending and tailing off, less commonly a rapid, liquid 5-note trill, "totowiddlywit". Near-synchronous combination of varied male and female notes produces almost endless variety of duets. Alarm, and calls associated with foraging at ant columns, a grating "zi-zi-zaar", hard, clicking "zutzutzutzu...", scolding "raaj-raaj-raaj..." and grunting "chack".
Habitat. Moist montane and submontane forest, dense undergrowth and regrowth, forest edges, bamboo groves and plantations, at 900–3000 m. In Tanzania found in juniper (*Juniperus*) forest in W Usambaras; in Malawi montane forest, and also in dense montane shrubland 3–4 m tall.
Food and Feeding. Invertebrates, including caterpillars, ants (Formicidae), grasshoppers (Orthoptera) and snails (Gastropoda). Solitary or in pairs; generally shy and skulking. Forages in dense understorey, from near ground up to 16–18 m in tallest trees, also in canopy (8–15 m tall) of low montane forest. Gleans bark and foliage. Occasionally attends ant swarms, without leaving thick cover; one or two individuals often follow swarm of *Dorylus* ants in Usambara Mts, hopping as low as 30 cm above ground in weeds and vines, making short sallies to ground, pecking lianas, stems and leaves, and giving variety of calls.
Breeding. Few details available. Season Dec–Feb in Tanzania, Sept–Jan (mainly Nov) in Malawi, and Nov–Jan in Zambia. Nest a shallow cup made of grass, rootlets and tendrils, placed among creepers or in fork of shrub; territory size 0·6–1 ha in narrow forest patches with plenty of thick regenerating scrub, larger in continuous forest, one territory was occupied for eight seasons. Clutch 1–2 eggs; incubation probably by both sexes (both have brood patch). Among ringing recoveries, oldest individual at least 7 years 4 months (bird ringed as adult). No other information.
Movements. Resident; highly sedentary, longest movement in Malawi only 250 m. Thought to be altitudinal migrant in Nguru Mts (Tanzania), occurring down to 1000 m in Oct.
Status and Conservation. Not globally threatened. Restricted-range species: present in Tanzania-Malawi Mountains EBA. Reasonably common in most of range; in continuous forest 2–3 pairs/10 ha, whereas eight forest patches each of 8–12 ha (totalling 73 ha) contained 18 pairs, i.e. average 4 pairs/ha. In Tanzania, race *usambaricus* common at 1500–2200 m in W Usambaras and at 900–2800 m in Ngurus, Ukagurus and Ulugurus; in Eastern Arc mountains as a whole reported also as scarce at 1100 m, but estimated 20 birds/km² at 1300 m, 40 at 1500 m, 47 at 1750 m and 43 birds/ha at 1980 m. Density of nominate race in S Tanzania less well known, but this race is frequent on Mt Luhombero (Udzungwa Mts) at 1900–2350 m; in Malawi local in Misuku Hills (where commoner with increasing altitude in Matipa), and present throughout Nyika, and N & S Viphya Plateaux at 1170–2500 m; in Zambia restricted to Nyika Plateau at 1900–2200 m. Although not currently at risk, this species could become of conservation concern by virtue of its fragmented, isolated montane-forest distribution.
Bibliography. Benson & Benson (1977), Benson, Brooke, Dowsett & Irwin (1971), Benson, Brooke & Vernon (1964), Butynski & Ehardt (2003), Collar & Stuart (1985), Dowsett (1980, 1983, 1985, 1987), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett & Leonard (2001), Dowsett-Lemaire (1983a, 1989), Dowsett-Lemaire & Dowsett (1984), Fishpool & Evans (2001), Fry *et al.* (2000), Fuchs *et al.* (2005), Hall & Moreau (1970), Harris & Franklin (2000), Jensen & Brøgger-Jensen (1992), Lovett & Stuart (2001), Lynes (1934), Mackworth-Praed & Grant (1960), Nguembock *et al.* (2008), Rand (1957b), Romdal (2001a, 2001b), Sclater & Moreau (1933), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Stevenson & Fanshawe (2002), Stuart & Jensen (1985), White (1962), Willis (1983b), Zimmerman *et al.* (1996).

22. Slate-coloured Boubou

Laniarius funebris

French: Gonolek ardoisé **German**: Trauerwürger **Spanish**: Bubú Fúnebre

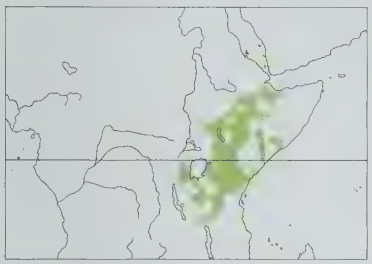
Taxonomy. *Dryoscopus funebris* Hartlaub, 1863, Meninga ["Unyamwesi area of Tanganyika Territory"], west-central Tanzania.

Recent molecular research indicates that this species constitutes a more recent branch within the genus than do *L. poensis* and *L. fuelleborni* and far more recent one than *L. leucorhynchus*. Race *degener* intergrades with nominate in coastal regions, S Kenya and NE Tanzania (E of Mt Kilimanjaro). Proposed race *atrocoeruleus* (from NE Ethiopia and N Somalia) synonymized with nominate. Two subspecies recognized.

Subspecies and Distribution.

L. f. funebris (Hartlaub, 1863) – NW Somalia and S through C Ethiopia to SE Sudan, SW & extreme E Uganda, Kenya and Tanzania.

L. f. degener Hilgert, 1912 – C & S Ethiopia and S Somalia, SE Kenya and NE Tanzania (E of Mt Kilimanjaro).



Descriptive notes. 18·5–20 cm; male 33–50 g, female 23–55 g. Nominate race has whole head, neck and throat glossy jet-black, grading posteriorly into dark blue-grey on upperparts and breast; rump plumage long and full with white feather bases, some feathers with whitish subterminal spots; uppertail-coverts and tail jet-black; belly and flanks smoky bluish-grey, paler than breast; thighs and undertail-coverts bluish grey-black; iris dark brown; bill and legs black. Sexes alike. Juvenile initially is dark brown above, feathers of forehead, mantle and upperwing-coverts with narrow rufous-buff tips, back and rump plumage full, fluffy, capable of being erected, feathers with rufous tip, dusky subterminal bar, buffy centre and grey base, rump barred rufous and blackish, uppertail-coverts very dark brown with narrow buff tips, tail short, black, underparts buff, rather evenly banded with slate-grey, the dark bands narrow and close on throat, becoming broader and more widely spaced rearwards to undertail-coverts; immature dull black above, forehead, hindneck, and mantle to rump and upperwing-coverts with very narrow rufous barring, underparts evenly banded dark slate-grey and buff, acquires adult plumage at c. 4–6 months (below, dark bluish-grey of adult acquired first on breast, then on side of belly). Race *degener* is slightly paler and smaller than nominate. Voice. Loud, varied; male and female generally sing in antiphonal duet with gong-like notes, ringing fluty whistles and harsh snarling sounds; 24 different duet notes have been identified, varying individually and geographically. Duet has two sex-specific components (one for each sex), each component learnt from a same-sex tutor in first 6–8 months of life (once learnt, individual repertoires do not change); either sex capable of producing elements that belong to other sex's repertoire; mated pair combines elements into set of pair-specific duets which remain constant for life (at least seven years). Duets and repertoires vary regionally; local dialects transmitted from one generation to the next by social learning. Duet generally initiated by male using "male" element, answered instantly by female using "female" element, but either sex can initiate duet with any element; duets often have three elements, either male or female one repeated. Each sex remembers opposite sex's voices as a "silent repertoire", parts of which can remain unsung for lengthy periods and then produced as occasion demands, as "sympathetic singing". A pair uses several different, standard, call–answer sequences and switches between them; in Kenya, males at L Baringo use four structurally different notes in initiating duets, females responding antiphonally with only one, and in repeated duets S of Nairobi a male uttered deep "clak" lasting 0·4 seconds and female chimed in instantly with rising "whee" lasting 0·3 seconds and beginning fractionally before the "clak" finished (so that whole duet lasted less than 0·7 seconds). A pair duets throughout day; intervals between duets seldom exceed 3–5 minutes except around mid-day; at Seronera, in Tanzania, a pair sang 100, 260 and 120 duets per hour in, respectively, morning, afternoon and evening, its duetting time amounting to 1–1·5 hours daily; when one pair-member forages on ground, mate keeps watch from perch several metres above it and the two repeatedly duet. Besides reacting vocally to its mate, individual reacts to same-sex rivals, whether seen or not, by counter-singing. One function of duetting is thought to be pair-bonding; one particular "male" song type functions to achieve breeding synchrony; two other types have territorial purpose (and relative frequencies vary with social correlates); another type appears to be used in mate-guarding; duets used also to maintain long-range contact (short-range contact maintained by soft, very quiet calls). Male generally sings 2–4 low, hollow "clo" notes and female responds instantly with rising "wooeee" or "clerwy" whistle or sometimes with sneezing "kitchu", thus duet sounds like "cloclo-wooeee, cloclo-wooeee" or "woko-clerwy, woko-clerwy" or "woko-kitchu"; also described as "haw-kwee", "chuwee, chuwee", "hortwee, hortwee" or "twi-twi". Male may utter trill instead of whistle, and female may respond with buzzy note, producing duet "wreeee-dzzrrr". Male can sing complete duet by himself; sometimes three birds call together, one making bubbling sound, one "whooeeoo" whistle and third "wheee-e-e". Female also delivers rapid "quick-quick", answered by male's "squee". Occasionally duets with a congener, including *L. aethiopicus* and *L. erythrogaster*. In alarm or excitement gives harsh, loud "kch-kch..." or "tek-tek...", shrill "rrrrh" or guttural churring sounds. Fledglings produce babble quite different from adult vocalizations.

Habitat. Semi-arid thornbush and acacia (*Acacia*) savanna woodland, mainly below 1500 m; from sea-level to 2200 m (mainly below 2000 m) in Kenya, e.g. at 1500–2000 m on Mt Kulal. Thick bushes along watercourses, overgrown cultivation, thorn-scrub, and in Ethiopia evergreen scrub and juniper (*Juniperus*) woods. Keeps to dense bushland thickets with massed tangles of creepers, in Somalia especially shrubs and small trees smothered in creepers (*Cissus rotundifolia*).

Food and Feeding. Mainly invertebrates, including grasshoppers (Orthoptera), mantids (Mantidae), beetles (Coleoptera), caterpillars, termites (Isoptera), ants, bees and wasps (Hymenoptera), small butterflies (Lepidoptera) and ticks (Ixodoidea); occasionally eats *Commiphora* fruits. In wet season, caterpillars form important part of diet of both adults and nestlings. In dry season, forages by hopping on ground in shade under woody cover, searching leaf litter; in wet season, feeds mainly among foliage, searching for caterpillars. Large prey items wiped to and fro against branch before being swallowed. Usually in pairs; skulking, shy and retiring but noisy.

Breeding. Season Apr–Jul in Ethiopia, Apr–May and Oct in Somalia, Nov in Uganda; in Kenya, breeds in long and short rains, Mar–Nov, nesting 1–3 weeks after rainfall; Oct–May in Tanzania. Pair occupies territory throughout year, defends it by duet singing; in three cases of boundary transgressions, intruders were neighbouring pair nesting attempt of which had recently failed; fighting rare; sometimes a third individual present in territory, once a male and two females, both singing (at different times) in duet with male. In courtship male displays by holding himself upright on extended legs, lowering head, swinging body from side to side, then bending forward, lowering wings, raising and fanning tail, and erecting back and rump feathers into mottled, whitish puff above back; makes short flights between bushes, quivering wings rapidly, with puff expanded; in calling display, two birds face each other 30 cm apart for two minutes, presumed male bows with each deep churring call, answered by female with repeated hoarse cough, thrusting down and forward with each note. Nest built usually by both sexes, mainly female (male sometimes not helping at all), construction time 1–7 days, first nest usually taking longer than later ones, a firmly (sometimes loosely) made open cup built of shreds of bark fibre or of fine rootlets and twiglets, many with remains of seed pods and flower bracts still attached, lined with delicate rootlets and dry grass blades, outer wall sometimes covered with spider web; nest rim often trodden down by brood (so that nest shape changes from cup to platform), and one nest so poorly bound that it collapsed under weight of growing young; placed in vertical fork of small tree or on twiggy horizontal branch of large tree growing in middle of thicket of creeper-covered bushes, usually very well hidden; occasionally nest abandoned before completion and another started elsewhere (material taken from first nest); territory size 1·5–3·5 ha, territories contiguous or isolated. Clutch 2 eggs, sometimes 3, laid on consecutive days; if clutch lost, usually makes new nest, up to three attempts in a season; on day after losing first brood, one pair began to build three nests simultaneously; incubation from first egg, by both sexes when clutch completed (female's spells average 41 minutes, male's 48 minutes), nest-relief co-ordinated by duetting, sometimes only female incubates; incubation period 17 days; chicks brooded for up to 7 days, fed by both sexes, nestling period 14–15 days; fledgling fully capable of flight a few days after leaving nest, even though tail still very short, feeds itself but also begs whenever parent approaches. Of 17 nests at L Baringo, in Kenya, none successful: 12 clutches and 5 broods disappeared (most nests remaining untouched); predation by Nile monitor (*Varanus niloticus*) believed responsible.

Movements. Resident.

Status and Conservation. Not globally threatened. Fairly common in SE Sudan (SE of Torit), and occurs between Boya Hills and NE Uganda and NW Kenya. In Ethiopia, common in Rift Valley and to E, in hot low country around E highlands and to SW & S in Gamo Gofa and Sidamo Provinces; common at 900 m S of Mega and between Yavello, Neghelli and Giarso, in moister country at 1200 m around L Margherita, and in evergreen scrub at 1850 m. In Somalia, fairly common in NW (E to 46° E) and common towards Ethiopian border, and quite common in S, mainly in river valleys and near coast. Fairly common in Uganda in NE (Karamoja), uncommon and local in SW (Ankole, Katonga). Widespread and locally common in Kenya, but absent E of L Turkana and in hinterland W of it, absent also in SW (from Kongelai and Kerio valley to Kavirondo Gulf) and much of arid NE & E, and lowlands S of Malindi. Occurs throughout much of interior Tanzania, but absent from SE of Eastern Arc mountains, and scarce in much of W.

Bibliography. Archer & Godman (1961), Ash & Atkins (2009), Ash & Miskell (1983, 1998), Becker & Amir (1993), Benson (1946a), Borghesio & Ndang'ang'a (2001), Brown & Britton (1980), Carswell *et al.* (2005), Clarke (1985), Colston (1972), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Duckworth, Evans *et al.* (1992), Fishpool & Evans (2001), Friedmann (1937), Fry *et al.* (2000), Fuchs *et al.* (2005), Gahr *et al.* (1998), Hall & Moreau (1970), Harris & Franklin (2000), Helversen (1980), Hooker & Hooker (1969), Lack & Quicke (1978), Lewis & Pomeroy (1989), Lynes (1934), Mackworth-Praed & Grant (1960), Nguembock *et al.* (2008), Nikolaus (1987), Payne (1971), Redman *et al.* (2009), Schmidl (1982), Schwabl & Sonnenschein (1992), Selater & Moreau (1933), Seibt & Wickler (2000), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), van Someren (1932, 1956), Sonnenschein (1992), Sonnenschein & Reyer (1983, 1984), Stevenson & Fanshawe (2002), Thorpe (1972), Urban & Brown (1971), White (1962), Wickler (1972, 1976, 1980, 1985), Wickler & Lunau (1996), Wickler & Seibt (1979, 1982a, 1982b), Wickler & Sonnenschein (1989), Williams (1995), Zimmerman *et al.* (1996).

23. Lühder's Bush-shrike

Laniarius luehderi

French: Gonolek de Lühder **German**: Braunscheitelwürger **Spanish**: Bubú de Lühder

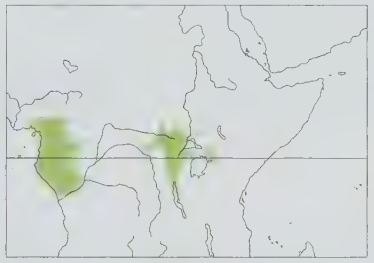
Taxonomy. *Laniarius lühderi* Reichenow, 1874, Cameroon.

Forms a superspecies with *L. brauni* and *L. amboimensis*, and all formerly regarded as conspecific. Recent molecular-genetic work indicates that this superspecies is sister to the superspecies formed by *L. aethiopicus* and *L. turatii*. Races intergrade in Ruwenzori Mts (E DRCongo); species sometimes treated as monotypic. Two subspecies tentatively recognized.

Subspecies and Distribution.

L. l. luehderi Reichenow, 1874 – extreme SE Nigeria (Calabar area) and S Cameroon S to NW Angola (Cabinda) and S PRCongo (lower R Congo); extreme S Sudan, NE & E DRCongo, Rwanda and Burundi S to W & E sides of L Tanganyika.

L. l. castaneiceps Sharpe, 1891 – extreme E DRCongo (Ruwenzori Mts), S Uganda and SW Kenya.



Descriptive notes. 18–19 cm; male 30–49 g, female 35–45 g. Distinctive bush-shrike with chestnut cap, round-ended tail (central feather pair 10–14 mm shorter than outer rectrix), and robust bill. Nominate race has forehead and narrow line on side of crown pale cinnamon, merging into chestnut on crown and nape; lores, areas just above and below eye, ear-coverts, side of neck, hindneck, mantle and scapulars glossy black with dark blue or dark green reflections, feathers with grey bases (usually concealed); lower back and rump feathers long, full and loose (overlying rump and uppertail-coverts), dull black with whitish ends and whitish subterminal spot (effect of mottled greyish rump grading to whitish uppertail-coverts); tail black; upperwing black, primaries and outer secondaries with glossy outer webs, inner secondaries, tertials and coverts matt black, but two secondaries with white outer web, and median coverts and some greater coverts broadly tipped white; chin, throat and breast deep cinnamon, rest of underparts white, underwing-coverts and axillaries white; iris dark brown-red; bill black; legs slate-blue or light blue. Sexes alike; neck skin of male thickened and distensible, perhaps linked with throat inflation and decisive head movements when calling. Juvenile is olive-brown above with rufous uppertail-coverts, all finely barred light brown and blackish, no white in wing, has chin and throat pale whitish-grey, underparts olive-yellow with fine dark bars, vent and undertail-coverts unbarred buff, eyes reddish-brown, bill dark grey-brown, legs pale bluish-grey; immature upperparts olive-brown with wide yellowish shoulder streak, tail dull rufous, throat and breast yellowish, rest of underparts whitish, described also as being olivaceous blackish-brown above with obscure paler supercilium, blackish lores and eye mask, primaries and secondaries narrowly edged and tipped rufescent buff, tertials more broadly edged and tipped buffy, upperwing-coverts similarly tipped, chin and throat pale yellowish, merging to orange-rufous on breast and to whitish below, a few thin blackish bars across breast. Race *castaneiceps* differs from nominate only in being rather smaller and paler. Voice. Complex and poorly understood repertoire, regionally variable. Male and female call in duet, using same note or quite different ones; duet a very soft, tremulous, falling "coo" or "keow" by male and low churring "cha-cha-ch-ch..." by female; main calls in DRCongo described as "crrrou" and hoarse "whaw" or "k-kaw" with strange metallic timbre, lasting c. 1 second, answered with dry "k-k-k-k" by presumed female; in Rwanda male gives soft "prru" and guttural "worr" note, female cutting in almost synchronously with harsh, cackling, exclamatory "kè-kè-kè-

kè-kè" or harsh, grating and snoring "wawh-kik-zzha-zzha-zzha"; female's response sometimes an excited slightly crescendo series of cackles, "wawh-kakakekekekikiki", which she may also give unaccompanied as continuous scold; male "coo", "crrrou" and "prru" notes probably same; "keow" and "worr" probably same; "cha-cha", "k-k-k-k" and "kè-kè-kè-kè-kè" probably same; male call lasts 0·2–0·55 seconds, female response starts 0·2–0·25 seconds after male starts, and lasts 0·3 seconds (three "kè" notes) to 0·5 seconds (five notes). With each guttural "crrrou" or "keow", repeated at long, irregular intervals, male bends head and neck forwards, markedly inflates throat and moves head decisively up and down; commonly heard "crrrou" call thought to be used by male for pair contact and territorial advertisement (and described also as a deep, croaking, snoring, hoarse, metallic, guttural and resonant "horrr", "whook" or "worrrrk" with throaty, rolling, frog-like quality). Other duets include liquid whistling "weeo-k'wee" by male and female together; male's explosive, hollow "yo" followed by rapid "yoyoyo", female responding with strident clicks; male's soft, tremulous "keow" answered by female's low, churring "cha-cha" or "chee-uu-graa"; female may respond to male's "crrrou" with harsh "tikk" or long "kssshshsssh". Also utters long "kiurrrr", sharp "tzik, tzik", whistles and harsh notes.

Habitat. Inhabits thick vegetation in abandoned clearings, overgrown plantations and young secondary growth, dense scrub and tall but open secondary forest near lowland towns and villages in forest zone; *Symphonia* gorge forest near PRCongo coast; exceptionally in primary forest (Itombwe, in E DRCongo); sea-level to 2800 m.

Food and Feeding. Mainly caterpillars, especially those in parasol trees, beetles (Coleoptera) and grasshoppers (Orthoptera); also mantises (Mantidae), moths (Lepidoptera), termites (Isoptera), leafhoppers (Cicadellidae), spiders (Araneae), woodlice (Isopoda) and tiny snails (Gastropoda). Forages mainly low down in vegetation and sometimes on ground, but also up to middle levels in trees; keeps in thick, impenetrable cover, but is inquisitive, and can be drawn momentarily into the open. Occurs in mixed-species foraging flocks.

Breeding. Season Sept–Oct in Nigeria, Aug–Oct and Dec in Cameroon, and Sept, Nov–Dec and Feb in Gabon; in DRCongo, in breeding condition in Apr and Jul in NE (Nepoko) and various breeding evidence May–Jul and Oct–Dec in E (Itombwe); Jun–Jul and probably Oct–Nov in Uganda and Kenya. Apparently monogamous and territorial. Nest slight, flimsy, a usually shallow (sometimes quite deep) open cup, loosely made of rootlets, dry weed stems, creeper fibres or thin dry twigs, lined with fine rootlets, sited 1·8–2·5 m above ground on fork well inside small tree, bush or, in Cameroon and Gabon, in the large half-shrubby *Triumfetta*; once on frond of young oil palm (*Elaeis guineensis*) in tangled vegetation. Clutch 1–2 eggs, laying interval 24 hours; replacement laid if clutch lost (once, after egg in first nest disappeared, clutch present only 16 days later in new nest built in palm a few metres away); incubation by both sexes, sometimes by female alone, period c. 15 days; chicks tended by both parents, nestling period c. 15 days.

Movements. None known; probably resident.

Status and Conservation. Not globally threatened. Generally uncommon to not uncommon in W range; common in E. Not uncommon in Nigeria (near Calabar); in Cameroon, widespread in forest zone in SW, common or fairly common in Victoria–Kumba–Dikume Balue area; common and widespread in Gabon, where recorded density of 2–3 pairs/10 ha in secondary growth; in PRCongo, occurs in Odzala National Park, in Nouabalé-Ndoki National Park (near Mombongo), and scarce in Kouilou Basin in SW (from coast E to Mayombe and upstream to Stanley Pool). Possible presence on Bioko I (Fernando Póo) and in Central African Republic not confirmed. In Sudan, common in Imatong Mts (up to 2800 m) and uncommon on Aloma Plateau. In DRCongo, widespread in NE & E (W to between Kisangani and Tshopo Falls), common between R Nepoko and R Bomokandi, and quite common in E (up to 1850 m) S to about Kivu–Katanga border at L Tanganyika; very common in Itombwe Highlands (at 900–2000 m); possibly present along N borders of rainforest, but few early sight records and no recent ones. In Uganda, common at 700–2400 m from Bwamba and Kibale to Ankole and Kigezi, E to Kifu and Mabira; occurs in Agoro-Agu Forest Reserve in extreme N and on Mt Elgon in extreme E. In Rwanda confined to W third, including W part of Nyungwe Forest, and in Burundi known only from Musigati and Karahe Forest (at 1750–2300 m). In Kenya, locally fairly common from Mt Elgon and Kapenguria S to Kakamega, Mau and Trans-Mara, Lolgorien and Mara Game Reserve; in W Tanzania from Gombe Stream National Reserve S to Mahari Mts.

Bibliography. Bannerman (1939a, 1953), Bates (1911), Borrow & Demey (2001), Bowden (2001), Britton (1980), Brosset & Érard (1986), Carroll (1988), Carswell *et al.* (2005), Chapin (1954), Dehn & Christiansen (2001), Dowsett (1990), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire (1990, 1997a, 1997b), Dowsett-Lemaire & Dowsett (1990, 1991, 1999), Fishpool & Evans (2001), Fry *et al.* (2000), Fuchs *et al.* (2005), Gaugris *et al.* (1981), Germain (1992), Hall & Moreau (1970), Harris & Franklin (2000), Jackson & Sclater (1938), Leisler & Winkler (2001), Lewis & Pomeroy (1989), Mackenzie (1978, 1979), Mackworth-Praed & Grant (1960, 1973), Nguembock *et al.* (2008), Prigogine (1953a, 1971, 1978), Prinzinger, Kleim *et al.* (1997), Schouteden (1969), Serle (1943a, 1959), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), van Someren (1932), Stevenson & Fanshawe (2002), Thorpe (1972), Urban & Brown (1971), Vande weghe & Loiselle (1987), White (1962), Zimmerman *et al.* (1996).

24. Braun's Bush-shrike

Laniarius brauni

French: Gonolek de Braun **German**: Angolawürger **Spanish**: Bubú de Braun
Other common names: Orange-breasted Bush-shrike(!)

Taxonomy. *Laniarius lühderi brauni* Bannerman, 1939, Quicolungo, Angola.
Forms a superspecies with *L. luehderi* and *L. amboimensis*, and all formerly regarded as conspecific. Recent molecular-genetic work indicates that this superspecies is sister to the superspecies formed by *L. aethiopicus* and *L. turatii*. Monotypic.

Distribution. NW Angola (S Uíge and NW Cuanza Norte).



Descriptive notes. 17·5 cm; one male 55 g, two females both 54 g. Male has forehead, crown, nape and hindneck chestnut, slightly paler in front and at side; feathers behind nostrils, lores, areas just above and below eye, ear-coverts, and band down side of neck to mantle and scapulars jet-black, slightly glossy; lower back and rump feathers (long, full and fluffy) greyish-black with large white subterminal spots, uppertail-coverts dull black; tail black; upperwing glossy brownish-black (flight-feathers becoming brown with buffy edges before being moulted), long white line in wing formed by white median coverts, large white tips on inner two or three greater coverts, and narrow outer edges and tips on innermost two secondaries; chin, throat and breast bright orange-red, rest of underparts pure white (lower flank feathers full, silky, fluffy); underwing-coverts and axillaries white; iris dark greyish-brown; bill black; legs slate-grey. Female differs from male only in that red area below appears less extensive. Juvenile apparently undescribed. Voice. Little known. Includes nasal twanging "tzaanana-tzaanana" and "tszowarrr" notes, likened to sound made by releasing a spring; very like contact calls and duetting songs of *L. luehderi* and *L. amboimensis*.

Habitat. Undergrowth of degraded secondary forest and gallery forest.

Food and Feeding. No information.

Breeding. Said to breed in Mar. No further information.

Movements. No information.

Status and Conservation. ENDANGERED. Restricted-range species: present in Western Angola EBA. Found only in small area of escarpment forests in NW Angola, where recorded at six localities: Bolongongo, Quicolungo, Canzele, Camabatela and 30 km S of Uíge (all within 25 km radius of each other) in altitudinal range 600–1265 m, and Quibaxe (74 km W of Bolongongo) at 935 m. Very few specimens or sightings on record, and most of these old, but recent relaxation of conflict that broke out in 1974 is allowing renewed observation; in Jan 2005, three duetting pairs were discovered in small patch of degraded forest 30 km S of Uíge. Almost nothing is known about present status of the Camabatela Forests Important Bird Area (IBA); coffee fazendas were commercially booming up to early 1970s, when logging of escarpment highlands had proceeded steadily for years, but coffee plantations have subsequently been neglected and coffee production has declined through the protracted period of civil war; the forest bird fauna may well have benefited somewhat.

Bibliography. Anon. (2008d), Bannerman (1939a, 1951, 1953), Butchart & Stattersfield (2004), Collar & Stuart (1985), Collar *et al.* (1994), Dean (2000b), Demey (2005), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Fishpool & Evans (2001), Fry *et al.* (2000), Hall & Moreau (1970), Harris & Franklin (2000), Mackworth-Praed & Grant (1963, 1973), Nguembock *et al.* (2008), da Rosa Pinto (1960), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Sinclair, Chamberlain *et al.* (2007), Sinclair, Spottiswoode *et al.* (2004), Stattersfield & Capper (2000), Traylor (1963), White (1962).

25. Gabela Bush-shrike

Laniarius amboimensis

French: Gonolek de l'Angola **German**: Amboimwürger **Spanish**: Bubú Angoleño
Other common names: Amboim Bush-shrike

Taxonomy. *Laniarius lühderi amboimensis* Moltoni, 1932, Amboim, Angola.
Forms a superspecies with *L. amboimensis* and *L. brauni*, and all formerly regarded as conspecific. Recent molecular-genetic work indicates that this superspecies is sister to the superspecies formed by *L. aethiopicus* and *L. turatii*. Monotypic.

Distribution. Small area around Gabela (in escarpment zone of W Cuanza Sul), in W Angola,



Descriptive notes. 17·5 cm. Forehead, crown, nape and hindneck are chestnut, slightly paler in front and at side; feathers behind nostrils, lores, areas just above and below eye, ear-coverts, side of neck, mantle and scapulars slightly glossy jet-black, lower back and rump (feathers long, full and fluffy) greyish-black, uppertail-coverts black; tail black; upperwing glossy brownish-black, long white line formed by white median coverts, large white tips on inner greater coverts, and narrow outer edges on innermost secondaries; chin, throat and entire underparts pure white; iris dark brown; bill black; legs slate-grey. Sexes alike. Juvenile apparently undescribed. Voice. Very like that of *L. luehderi*. Commonest call a deep, guttural, frog-like "worrrk" or disyllabic "wor-worrrk", repeated every 3–4 seconds; dry rattle "ker-r-r-r-r-r-r-r-r-r" which, when tape-recorded and played back, caused birds to switch to fast, deep "whioo whioo" whistle repeated every 1·5 seconds, and to harsh "tsik ksh-ksh-kshk" (the "tsik" and "ksh-ksh-kshk" possibly uttered by different individuals).

Habitat. Undergrowth in wet evergreen escarpment forests and degraded farmbush; on Mt Njelo, S of Gabela, lusher lower seaward slopes where forest merges with abandoned and regenerating shade coffee plantations; found in degraded secondary forest, old coffee plantations and primary forest at Kumbira Primero (Conda).

Food and Feeding. No information.

Breeding. No information.

Movements. Presumed resident.

Status and Conservation. ENDANGERED. Restricted-range species: present in Western Angola EBA. Known only from small area in escarpment zone near Gabela, in W Cuanza Sul; one old specimen (in Lubango Museum) from Egito, 125 km farther S, near Lobito. First discovered in 1930 and rediscovered in 1960 at Gabela (formerly Amboim); two pairs found in three days in 1992 at Conda and Assango; during short visits in 2001, 2002, 2003 and 2005, found to be fairly common in Kumbira Forest at 800–1000 m on W flank of Mt Njelo (7 km S of Conda), and also in degraded farmbush below 800 m with subsistence agriculture. Gabela, Conda, Assango and Kumbira are in radius of 15 km of each other, an area of 700 km²; Egito is 7·5 km to S (near Lobito). Scarp forests had been selectively logged before civil war broke out, in 1974; in that year a proposal was made to protect an area of 50 km² around Gabela, but it was not implemented; valley bottoms have now been cleared of undergrowth and 20–70% of canopy trees felled for banana, sweet potato, cassava and maize agriculture. Little more known about present status of Gabela forests themselves. The fact that this species has recently been found to inhabit farmbush, as well as intact forest, gives some grounds for optimism about its survival.

Bibliography. Anon. (2008d), Bannerman (1939a, 1951, 1953), Butchart & Stattersfield (2004), Cohen *et al.* (2004), Collar & Stuart (1985), Collar *et al.* (1994), Dean (2000b), Demey (2003), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Fishpool & Evans (2001), Fry *et al.* (2000), Hall & Moreau (1970), Harris & Franklin (2000), Hawkins (1993), Mackworth-Praed & Grant (1963, 1973), Mills & Dean (2007), Nguembock *et al.* (2008), Quantrill (2006), da Rosa Pinto (1960, 1962), Ryan *et al.* (2004), Sibley & Monroe (1990), Sinclair & Ryan (2003b), Sinclair *et al.* (2004), Stattersfield & Capper (2000), Traylor (1963), White (1962).

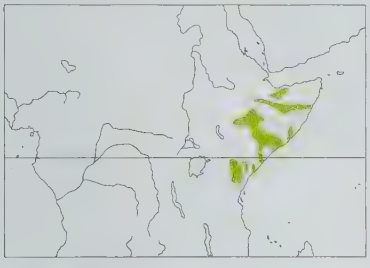
26. Red-naped Bush-shrike

Laniarius ruficeps

French: Gonolek à nuque rouge **German**: Rotnackenwürger **Spanish**: Bubú Nuquirrojo

Other common names: Red-naped Shrike, Red-crowned Shrike/Bush-shrike

Taxonomy. *Dryoscopus ruficeps* Shelley, 1885, Burao, Somalia.
Recent molecular-genetic studies indicate that this species is closest to *L. erlangeri*, the two composing a clade (lineage) that is deeper-branched than, or sister to, *L. aethiopicus*, *L. turatii*, *L. ferrugineus*, *L. sublacteus*, *L. bicolor*, *L. barbarus*, *L. erythrogaster*, *L. mufumbiri* and *L. atroflavus*. Three subspecies recognized.
Subspecies and Distribution.
L. r. ruficeps (Shelley, 1885) – NW Somalia.
L. r. rufinuchalis (Sharpe, 1895) – EC, S & SE Ethiopia and C & S Somalia (except SE coast).
L. r. kismayensis (Erlanger, 1901) – S Somalia coastal lowlands and NE & SE Kenya.



Descriptive notes. 18–19 cm; one male 35 g, female 29–33·4 g. Male nominate race has forehead black, crown, nape and hindneck bright orange-rufous or rufous-red, well-defined long white superciliary stripe from bill to side of neck (broadest above nostril); lores and area just above and below eye black, ear-coverts glossy black, narrow black stripe down side of neck joining ear-coverts and scapulars; mantle bluish-grey in mid-line, paling towards side of neck, upper back ash-grey, feathers of scapulars and lower back jet-black with bluish gloss and large white subterminal spots; rump feathers silky and fluffy, white with dark grey bases and narrow blackish tips, uppertail-coverts black; tail black, all except central two feather pairs with white terminal patch 10 mm deep, outermost rectrix also with white outer web; upperwing black, broad white longitudinal stripe formed by white median coverts, three inner greater coverts, and outer webs of three innermost secondaries; entirely creamy white below, side of breast and flanks washed with pale pink-buff; marginal and lesser underwing-coverts creamy white, greater under primary coverts dusky; iris hazel-brown; bill black; legs blue-grey or slate-grey, soles whitish. Female differs from male in having back olive-grey, not ash-grey. Juvenile lacks black facial mask, has ear-coverts dusky, indistinct pale supercilium, forehead to back uniformly olive-grey, scapulars brown with buffy tips (giving barred appearance), primary coverts and outer greater coverts brown with well-defined narrow buff edges and tips, tail greyish-olive, outer two rectrices broadly tipped and edged rufous-brown, underparts buffy brown-grey, throat and middle of belly whitish. Race *rufinuchalis* is similar to nominate, but black of forehead extends onto crown, so that only nape and hindneck are orange-rufous, breast and flanks buffy rufous; *kismayensis* is like previous, but mantle pale grey, extent of black on forehead and crown apparently variable. Voice. Not well known; varied, described as creaking (like sound of fishing reel), and harsh cawing very like main call of Pied Crow (*Corvus albus*). Song a short duet initiated apparently by either sex, a low-pitched "cheeo-oo" whistle or guttural snoring "gwaaar" or "grrrra" followed instantly by loud ticking or clicking in descending series, "grrrra-tktktktktktktk"; solo song or call a repeated low-pitched "kwoi" or longer "whooi"; alarm a loud burst of clicking and harsh scolds; clicks and explosive calls said to be like those of *L. barbarus*.
Habitat. Dense, impenetrable thornbush, in NW Somalia particularly *Acacia orphota*, and open thorn-scrub; sea-level to 1000 m.
Food and Feeding. Adult and larval insects. Forages on ground and lower branches in thickets, where it hunts silently, moving rapidly but furtively; secretive, skulking in shadiest interior of thorn thickets, but occasionally climbs to top of tree and stays there in full view for a few seconds. Foraging mates generally widely separated, and frequently give contact calls.
Breeding. Poorly known. Season May. Solitary breeder; possibly at times loosely colonial, with old (1920) record of 14 individuals found at Kyal, in Somalia, on one day in Jan and one day in May. Nest a thin structure made of twigs, rootlets and grass stems, placed 1·5 m above ground in bush or tree, often dense thorny acacia tree. Clutch 2–3 eggs. No other information.
Movements. Resident; may move locally.
Status and Conservation. Not globally threatened. Patchily distributed, and uncommon to locally common. In Somalia, present in NW in Burao region, common at Kyal, and patchily distributed from coast near Eyl S to hinterland of S Somalia, as far as Ethiopian and Kenyan borders. Uncommon in Ethiopia in S & SE, formerly common around Yavello; only 28 records, 18 old and ten recent. In Kenya, locally common below 1000 m from Garissa, Mwingi, Kitui and Mutomo Districts S to Mtito Andei, Ngulia, Maungu, Taru, Lali Hills and Galana Ranch; common around Kiunga (on coast near Somalia border), and extends S towards Boni Forest; recorded also in Mandera and Wajir Districts, in NE.

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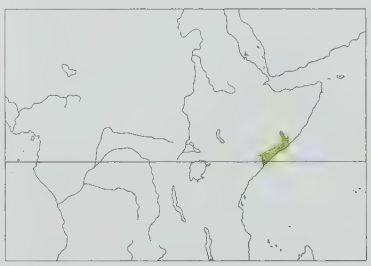


27. **Somali Boubou**

Laniarius erlangeri

French: Gonolek d'Erlanger **German**: Erlangerwürger **Spanish**: Bubú de Erlanger
Other common names: Erlanger's Boubou; Bulo Burti Bush-shrike ("*L. liberatus*")

Taxonomy. *Laniarius erlangeri* Reichenow, 1905, Umfudu, Jubba River, south Somalia.
Recent molecular-genetic studies indicate that this species is closest to *L. ruficeps*, the two composing a clade (lineage) that is deeper-branched than, or sister to, *L. aethiopicus*, *L. turatii*, *L. ferrugineus*, *L. sublacteus*, *L. bicolor*, *L. barbarus*, *L. erythrogaster*, *L. mufumbiri* and *L. atroflavus*. Was until recently regarded as a race of *L. aethiopicus*. A single bird caught in Somalia in 1989 was described as a distinct species, *L. liberatus*, but recent analyses of nuclear and mitochondrial DNA reveal that it is a variant of present species, and the possibility of its being a hybrid between this species and *L. ruficeps* rejected as highly improbable. Monotypic.
Distribution. Lower Shabeelle and Jubba valleys and coastal lowlands (between equator and 4° N), in SE Somalia.
Descriptive notes. 20 cm. Has forehead, crown, lores, cheek, ear-coverts, side of neck, hindneck and upperparts black with slight greenish gloss, lower back and rump (feathers long and fluffy)



with concealed white spots; tail black, outer feathers tipped white; upperwing black, median coverts distally white; white below, breast and flanks tinged pale pink; iris deep red; bill black; legs bluish-slate. Differs from very similar *L. aethiopicus* (of race *major*) in smaller size, greenish (not bluish) gloss, white in wing confined to median coverts, paler pink on underparts, slightly stouter bill. Black morph has plumage entirely black with bluish gloss, no concealed white spots in rump, tail without white tips on outer feathers. Both morphs occur in Jubba valley, only black morph in Shabeelle valley. Bulo Burti variant ("*liberatus*") has black parts of plumage unglossed, broad pale yellow superciliary stripe from bill to side of hindneck, pale yellow feather tips on hindcrown and nape, a few off-white tips on back feathers, partly concealed broad white subapical spots on most rump feathers, small white tips on all tail feathers except central pair; tertials and secondaries dull brown-black, outer webs of secondaries S4–S6 white-edged, inner greater wing-coverts with broad white tips on outer webs, median cov-

erts with small white tips on outer webs; mostly white below, side of throat, upper breast and side of lower breast pale yellow. Sexes alike. Juvenile is duller than adult, with pale feather tips above and some barring below. Voice. Poorly known, but said to differ markedly from voice of *L. aethiopicus*; may be rather silent. The single known Bulo Burti individual uttered ascending, disyllabic whistles, "poo-eeh" or "tuwe...tuwe", also low harsh churrs in flight, and single low "chack" calls when feeding.

Habitat. Thick bush and thorny thickets dominated by *Acacia nilotica* trees and with narrow riverbank woods and scattered *Cadaba mirabilis* bushes over very sparse herb layer; copses where umbrella-shaped canopy reaches ground, the low trees covered with climbing cucurbits, legumes and composites; also coastal scrub and dense, woody thickets.

Food and Feeding. Following details from observations on captive individual. Ate crickets (Orthoptera), cockroaches (Blattodea), and geckos (Gekkonidae) and other lizards; when it took a lizard in aviary, it carried this in its bill to a broken horizontal branch with spiky wood splinters and repeatedly beat the prey against the spikes until it was torn to pieces. On release, it foraged in or below dense tangled vegetation, taking prey on the ground or in very low branches deep inside acacia bushes, where it hopped around on ground rather in manner of a *Turdus* thrush, turning over branches and leaf litter; it followed same foraging route daily, spending 1–2 hours in one acacia bush before making a short low flight to another.

Breeding. No information.

Movements. Presumably resident.

Status and Conservation. Not assessed. Has very small overall range, but common and thought not to be of global conservation concern. Occurs along less than 450 km of coastal lowland between Mogadishu and Kismaayo (possibly no more than the 250 km where Webi Shabeelle runs parallel to coast, in province of Shabeellaha Hoose), and thence c. 250 km upstream in R Jubba valley and c. 230 km up Webi Shabeelle valley from Balcad Nature Reserve (near Mogadishu) to Buulobarde. Nothing known of the extent to which its habitat and population have been affected by civil unrest, agricultural development and urban growth. Balcad Nature Reserve is in one of the least disturbed patches of vegetation in R Shabeelle drainage system and is officially protected.

Bibliography. Anon. (2008d), Archer & Godman (1961), Ash & Atkins (2009), Ash & Miskell (1983, 1990), Butchart (2007), Butchart & Stattersfield (2004), Collar (1998, 1999), Collar *et al.* (1994), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Fishpool & Evans (2001), Fry *et al.* (2000), Hall & Moreau (1970), Harris & Franklin (2000), Hustler (1996), LeCroy & Vuilleumier (1992), Mackworth-Praed & Grant (1960), Mearns & Mearns (1998), Nguembock *et al.* (2008), Prinzinger, Becker *et al.* (1997), Redman *et al.* (2009), Sibley & Ahlquist (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Smith *et al.* (1991), Stattersfield & Capper (2000).

28. Tropical Boubou

Laniarius aethiopicus

French: Gonolek d'Abyssinie **German**: Boubouwürger **Spanish**: Bubú Abisinio
Other common names: Tropical Bush-shrike, Ethiopian Boubou/Bush-shrike/Bellshrike, Bell Shrike, Boubou Shrike

Taxonomy. *Turdus aethiopicus* J. F. Gmelin, 1789, Ethiopia.

Forms a superspecies with *L. turatii* and closely allied also with *L. ferrugineus*, *L. sublacteus* and *L. bicolor*, the five previously treated as a superspecies and sometimes even as a single species. Until recently, *L. erlangeri* and *L. sublacteus* were included as races of present species. Where present species and *L. ferrugineus* meet, in R Limpopo valley (in N South Africa and Mozambique), their races are very similar and may hybridize and intergrade; but along R Runde, in Zimbabwe, race *limpopoensis* of present species overlaps with smaller race *savensis* of *L. ferrugineus* without interbreeding. Population on plateau of WC Angola, having especially white underparts, may represent an undescribed taxon. Race *major* intergrades with *mossambicus* in N Zambia and extreme N Malawi. Five subspecies currently recognized.

Subspecies and Distribution.

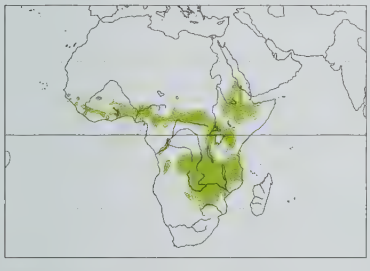
L. a. major (Hartlaub, 1848) – W Senegal (Casamance), N, SW & SE Guinea, NE Sierra Leone, NW Liberia, S Mali (Baoulé-Sud, Farako), C Ivory Coast, NE, C & S Ghana, Togo, Benin (S from Bétérou), C & S Nigeria, C & E Cameroon, S Chad and SW & C Central African Republic E to S Sudan, Uganda, Kenya (E to Rift Valley), Tanzania (E in N to Loliondo and Essimingor, in S to Njombe and Mahenge), N, E & SE DRCongo and R Congo (from Lukolela S to Kinshasa), C & E Angola, NW & N Zambia and extreme N Malawi.

L. a. aethiopicus (J. F. Gmelin, 1789) – E borders of Sudan, and Eritrea, Ethiopia, NW Somalia and N Kenya (Moyale area).

L. a. ambiguus Madarász, 1904 – highlands E of Rift Valley in Kenya (S from Mt Kulal and Mt Marsabit) and NE Tanzania (S to Mt Meru and Mt Kilimanjaro and Arusha and Moshi).

L. a. mossambicus (G. A. Fischer & Reichenow, 1880) – Zambia and Malawi, extreme NE Namibia (Caprivi Strip), N & E Botswana, Zimbabwe (except SE lowveld) and Mozambique.

L. a. limpopoensis Roberts, 1922 – SE Zimbabwe (area bordered by Sabi, Runde and Limpopo rivers) and extreme N South Africa (N Limpopo Province).



Descriptive notes. 19·5–25 cm; male 52–62 g and female 40–45 g (*major*), male 42–69 g and female 38–57 g (*mossambicus*), male 47·5–60 g and female 41–60 g (*ambiguus*). Nominate race is mostly glossy bluish-black above; feathers of lower back and rump long, full and fluffy, greyish or whitish with white subapical mark and black ends, overlying glossy bluish-black uppertail-coverts; tail black, slightly glossy, outer feathers sometimes white-tipped; upperwing mainly black, slightly glossy, median coverts white distally, innermost greater coverts with white outer web; throat and entire underparts white, breast and flanks tinged salmon pink; underwing-coverts white, axillaries white with pink tinge; iris deep red-brown; bill black; legs bluish-slate. Sexes alike. Juvenile has most feathers of upperparts tipped tawny-buff, underparts dull whitish, breast and flanks pale brown with some dusky barring, eyes sepia-brown, bill horn-coloured; immature like adult, but black areas duller and white areas buffy, upperwing-coverts and uppertail-coverts with buffish-white tips and edges, outer two pairs of rectrices with white tips. Races differ mainly in amount of white in wing and in tone of underpart colour: *major* is like nominate, but three innermost secondaries have white outer webs (combining with white of coverts to form long white wingstripe), breast and flanks only faintly tinged pink; *mossambicus* is like previous, but underparts strongly washed pinkish-buff, outer tail feathers never white-tipped; *limpopoensis* resembles last, but underparts buffy cream; *ambiguus* is like nominate, but black areas glossed greenish (rather than bluish), underparts much paler pinkish. Voice. Male and female sing in antiphonal duet, usually of 2–3 notes, sometimes of 5–8, occasionally up to 14, repertoire including repeated fluty whistles at variable pitch, resonant drawn-out whistles, and harsh tearing, croaking or snarling sounds. Some individual or pair variation, and geographical variation from mainly whistles in N of range to mainly croaks and snarls in S; fluty whistles vary from low-pitched single "hou" through double "boubou" to long series of rapid quavering or bubbling "bobobobobo..." noises; also long, loud and far-carrying whistles with resonant, bell-like quality, "hooooooooooo"; harsh notes (perhaps female's) include tearing "weeeer", "krzzzz", croaks, nasal snoring "haaw" and rattling "ke-ke-ke..."; common duet sounds like "ho-ho-u-ho", "hooooooo-ho-ho", "houho-weeer", "hoou-weeeer-hoou" or "weeer-weeer", the "ho" notes by male and "weer" notes by female; single individual can sing both its own and its mate's contributions. In experimental field study in Ivory Coast, twelve duet songs were identified, some initiated by male, others by female; important functions are joint territorial defence and mutual mate-guarding; after simulated territorial intrusions using tape playback, one particular duet was not used during encounters but always afterwards (that duet very loud and from high perch, male standing high on legs and raising bill skywards, appears to be a post-conflict display signalling victory). Male utters twanging "tchanananana", loud "schrang, schrang" and "kit-tuu-iii" notes in courtship and territorial threat; particularly vocal during nest-building period. Contact call a soft, low-pitched "bou"; alarm a chattering "ke-ke-ke..."; "tuk-tuk-tuk" calls given before settling to roost. Intense interactions accompanied by loud wing-fripping.

Habitat. Dense woody cover along riverbanks and watercourses, thickets and unkempt hedges in farmland and gardens, dense growth on termitaria and around bases of inselbergs and koppies; also thick elephant grass and tangles of creepers along edges of lowland forest and bushy hillside ravines; tall grass savanna, brachystegia (*Brachystegia*) woods, and dry *Acacia–Commiphora* bush; in highlands, found in *Hagenia* forest, *Arundinaria* bamboo, mixed evergreen scrub of olive (*Olea*), juniper (*Juniperus*) and *Podocarpus*, also bracken-briar and forest edges. Sea-level to mountains; to 3000 m in Kenya, 3030 m in Ethiopia.

Food and Feeding. Insects, including Orthoptera, mantises (Mantidae), termites (Isoptera), beetles (Coleoptera), caterpillars, other larvae and pupae; some small snails (Gastropoda) and small fruits; a few small vertebrates, including chameleons (Chamaeleonidae), skinks (Scincidae), geckos (Gekkonidae), amphibians, rodents, also bird eggs and nestlings; persistently raids nests of small birds, and often attacks waxbills (*Estrilda*). Young initially fed with quite large insects, later given several small vertebrates, most or all food obtained by parents within 20 m of nest. Shy and secretive, keeping inside cover, but inquisitive, even confiding, coming into the open on ground in large gardens and around game lodges. Forages mostly low down in woody vegetation and foliage, often dropping to ground, where it hops in leaf litter, turning a leaf or piece of bark when it sees an insect disappearing under it; gleans trunks, branches and foliage, but probably takes more food from ground than from vegetation; occasionally hawks for flying insects. Sometimes comes out from under bush and hunts in roadside drains or wet silt along path. Wedges larger prey items in a fork, and uses bill to tear them apart; not known to impale prey in the wild, but captive individual stuck pieces of meat on to branches in its aviary. Forages singly and in pairs, also in family groups; feeds alongside *L. bicolor* and *L. atrococcineus*, sometimes in same bush.

Breeding. Season May in Guinea, Feb–Mar and Jun in Nigeria, Jun–Sept in Sudan, Apr–Jun and Aug–Sept in Ethiopia and Eritrea, Apr–May in NW Somalia; in DRCongo, May in NE (Faradje), Dec–Jan in E (Baraka), Sept–Dec in SE (Katanga); in all months (mainly Mar–Jun) in Uganda and Kenya; Sept–Apr in Tanzania, Aug–Jun (mainly Sept–Feb) in Zambia, Sept and Jan in Malawi, Oct–Dec in Botswana, Jul–May (mainly Sept–Nov) in Zimbabwe, and Oct–Dec in Mozambique; double broods rare. Pair remains in territory all year, size c. 2 ha in breeding season, up to 8 ha at other times; territories well spaced, perhaps seldom contiguous, advertised and defended by calling, squabbles between neighbouring pairs rare; calling male often perches half-exposed on or near top of bush, bobs head and bows body with each note, in territorial interactions calling female often perches in bush below male. In courtship male chases female, the two hopping close together rapidly through foliage and branches and making short wing-fripping flights; male bobs head shallowly and, with neck extended, bows body, he gives snarling calls and flies or half-glides downwards with slow beats, whitish back and rump feathers fluffed out; courting male stands upright, raises head and calls, then depresses head and body while calling "kit-tuu-iii", he droops wings, fans tail, raises back and rump feathers and lets them droop fanwise while moving up and down, calling and fluttering in front of mate, then copulating. Nest built by both sexes, mainly female, several nests may be started, being successively plundered by pair, before female lays in definitive one; a shallow, open bowl made of loosely knitted rootlets and fine twiglets, lightly bound with spider web, sparsely lined with fine rootlets (usually eggs visible from below), well concealed in fork generally in thorn bush, or on horizontal branch among climbers and epiphytes, usually 1·5–3 m (sometimes up to 9 m) above ground, in tree such as *Terminalia prunioides*. Clutch 2–3 eggs; incubation mainly by female, less by male, sexes taking turns, at change-over singing in duet (initiated by sitting bird), period c. 15 days; chicks fed by both sexes, usually only one at nest at a time (if both parents away and male approaches nest, female gives call to warn chicks), nestling period c. 15 days; young can feed themselves by c. 7 weeks after leaving nest, remain with parents for c. 5 months, and have most of adult vocabulary by 5 months. Small number of nests (c. 2%) parasitized by Black Cuckoo (*Cuculus clamosus*); some pairs of present species appear to be repeatedly susceptible. From ringing studies, maximum recorded longevity at least 13 years 10 months.

Movements. Mostly resident; some adults strictly sedentary, but apparently a constant turnover of birds at a ringing station in Malawi. Local seasonal movements reported in Kenya; possibly some altitudinal movements in Ethiopia.

Status and Conservation. Not globally threatened. Uncommon to frequent over large part of sub-Saharan Africa; commoner in E & SE of range than in W & C. Sight record in Senegal (Casamance). In Guinea, common around Beyla and Macenta, in Haut Niger National Park, and recorded W to Gaoual and Conakry areas; frequent in E Sierra Leone, rare in Liberia (R Makona near Jalamai, and Monrovia), and common in C Ivory Coast; in Mali, small populations near Madina Diassa and at Farako; in Ghana, uncommon in coastal belt (from Axim to Accra Plains), frequent in N (at Mole and Tono Dam), otherwise known only from Wenchi, Ejura and Kete Kratchi; locally common in Togo S from Landa-Pozanda and Naboulgou, and frequent in Benin S at least from Bétérou; in Nigeria, not uncommon in S guinean savannas immediately N of forest zone, and occurs N to

On following pages: 29. Turati's Boubou (*Laniarius turatii*); 30. Southern Boubou (*Laniarius ferrugineus*); 31. East Coast Boubou (*Laniarius sublacteus*); 32. Swamp Boubou (*Laniarius bicolor*).

Kaduna, Jos Plateau and Yankari National Park, in suburbs of coastal towns and on Mambilla Plateau; in Cameroon, not uncommon N of forest zone (to c. 07° 30' N), in S penetrates forest zone in cleared areas and suburbs S to Gabon border; uncommon in Chad N to Sarh and Zakouma National Park; in Central African Republic, frequent in Dzanga Reserves, several records in middle latitudes, and rare in Bamingui-Bangoran National Park; in NE DRCongo, frequent and widespread in woodlands and grasslands N of Congo Basin rainforest (up to 1850 m) and penetrates S in cleared land to R Congo; common in SW Sudan, but uncommon near Ethiopian border in E & SE. Common to abundant in highlands in Ethiopia up to Sen'afe (at 3030 m), absent from hot lowlands in NE and from much of Ogaden, and uncommon or absent towards Kenya border; density of 34 birds/100 ha in Chilimo Forest (C Ethiopia). In Eritrea, frequent at up to 2725 m but absent from W and from dry coastal plain; common in NW Somalia. Common throughout Uganda; in Kenya, locally frequent in highlands in SW half of country; locally common to very common in Tanzania, in e.g. Serengeti National Park, occurs on Mt Kilimanjaro at 2050–2200 m, and absent from most of interior but locally frequent in Eastern Arc mountains, Mahenge and Njombe highlands and in SW. In Angola, frequent on WC plateau (area bounded by Lunda, Malanje and Huambo) and occurs also in E (Moxico), where status uncertain; in DRCongo (other than NE), occurs in W on lower R Congo, widespread in E & SE in woodlands S of rainforest block (in Kasai Occidental, S Kasai Oriental, throughout Katanga and in E Kivu); frequent to common and widespread in Zambia, but uncommon in W and absent from SW; in Botswana, fairly common to very common in Limpopo and Shashe drainages and at Kasane and Serondella, uncommon in Okavango and along R Botlete; common and widespread in Mozambique S to R Save, but in N absent from much of Zambezia and interior of Nampula. In South Africa, confined to riparian forest along R Limpopo and R Luvuvhu and tributaries in N lowveld, and Nyanda Bush in N Kruger National Park; density of 55 territorial pairs in 3·2 km² (i.e. 34 birds/100 ha) of linear transect along R Luvuvhu, and estimated population of 10,500 individuals in N Kruger National Park. Several records since 1998 in Lesotho.

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29. Turati's Boubou

Laniarius turatii

French: Gonolek de Turati **German**: Turatiwürger **Spanish**: Bubú de Turati
Other common names: Turati's Bush-shrike/Bellshrike

Taxonomy. *Dryoscopus turatii* J. Verreaux, 1858, "Senegal"; error = Guinea-Bissau.
Forms a superspecies with *L. aethiopicus* and closely allied also with *L. ferrugineus*, *L. sublacteus* and *L. bicolor*, the five previously treated as a superspecies and sometimes even as a single species. Has been treated as a race of *L. aethiopicus*, but the two overlap in range in a tiny area around Bafodia, in N Sierra Leone (formerly forested, and may have separated the two), where they do not react to each other, even though voices very similar. Monotypic.
Distribution. Guinea-Bissau S to Sierra Leone.



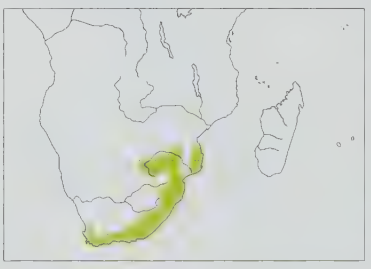
Descriptive notes. 20–22·5 cm. Forehead to hindneck and mantle, lores, upper cheek, ear-coverts and side of neck black, glossed with dark blue; scapulars and back feathers glossy black with concealed large white subterminal spots; rump feathers black, long, loose and fluffy, tips of overlying uppertail-coverts white; upperwing entirely glossy black; tail rather long, square-ended, black; chin, throat, breast and upper flanks buff-pink, merging to white on belly, rear flanks, thighs and undertail-coverts; inner underwing-coverts and axillaries black, greater under primary coverts black; iris dark brown; bill black; legs slate-grey or bluish-grey. Sexes alike. Juvenile undescribed. Voice. Male and female sing in synchronous duet, male uttering pure, soft, hollow whistle, "whawwhh", or drawn-out resonant, ringing, metallic "hoo, hoou-hoou" in slow series, and female a nasal, grating "dizhizhizhaaaanh" or "k-kchchnerr" and strident clicking notes; duet initiated by either sex. Also gives explosive "kek" notes, often in long series at variable speeds; in territorial threat and courtship uses slow nasal twanging calls, "wa-wa-zzzn-errrr". Bout of duetting may last several minutes. Voice very like that of *L. aethiopicus* in W Africa (but less variable, more stereotyped and more slowly delivered than that of *L. aethiopicus* in S Africa).
Habitat. Dense, creeper-festooned canopy of bushes and small trees in savanna woodland.
Food and Feeding. Little known. Forages singly and in pairs; shy. Foraging behaviour apparently like that of *L. aethiopicus*, but present species less inclined than latter to ascend high in tree. Where the two occur together (in N Sierra Leone), a pair of each species twice seen in same tree with no signs of aggression.
Breeding. Very little known. Breeds in May in Guinea-Bissau. Apparently monogamous and territorial. Nest a flimsy bowl made from grass stems and fine rootlets, may be lined with dry leaves, placed c. 2 m above ground in multiple horizontal fork in bush. Clutch 2 eggs. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Common in S of range. In Guinea-Bissau, old records from Farim and Gunnal; in Guinea, old record from Mamou and recent ones on coast and inland to Mambia, Foulayah, Koba and Kolenté, and frequent in N Fouta Djalon. Common and widespread in Sierra Leone E to Bafodia, Farangbaia and Shenge, with records farther SE at Bo and E of Bo and at Pujehun; common around Njala campus. May be in process of extending range E, at least in N Sierra Leone.
Bibliography. Bannerman (1939a, 1953), Borrow & Demey (2001), Collar & Stuart (1985), Demey (1995, 2007), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Field (1979), Fishpool & Evans (2001), Fry *et al.* (2000), Hall (1954), Hall & Moreau (1970), Harkrider (1993), Harris & Franklin (2000), Mackworth-Praed & Grant (1973), Nguembock *et al.* (2008), Serle & Morel (1977), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Thorpe (1972), White (1962).

30. Southern Boubou

Laniarius ferrugineus

French: Gonolek boubou **German**: Flötenwürger **Spanish**: Bubú Ferrugíneo
Other common names: Ferrugin(e)ous Bush-shrike/Boubou, African Bush-shrike/Boubou

Taxonomy. *Lanius ferrugineus* J. F. Gmelin, 1788, Cape of Good Hope, South Africa.
Has been treated as conspecific with *L. aethiopicus*, *L. turatii*, *L. sublacteus* and *L. bicolor*; genetically closest to *L. sublacteus* and perhaps forming a superspecies with it, but somewhat less closely allied with *L. bicolor* and a little farther removed from *L. aethiopicus* and *L. turatii*. Where present species and *L. aethiopicus* meet, in R Limpopo valley (in N South Africa and Mozambique), their races are very similar and may hybridize and intergrade; but along R Runde, in Zimbabwe, race *savensis* of present species overlaps with the larger race *limpopoensis* of *L. aethiopicus* without interbreeding. Six subspecies recognized.
Subspecies and Distribution.
L. f. savensis da Rosa Pinto, 1963 – SE Zimbabwe (lower R Runde) and S Mozambique (R Save valley).
L. f. transvaalensis Roberts, 1922 – SE Botswana (Gaborone and Lobatse areas) and lowlands of N South Africa (N North West Province and Limpopo Province, excluding Limpopo Valley, S to E Mpumalanga and N KwaZulu-Natal) and E Swaziland.
L. f. tongensis Roberts, 1931 – SE & extreme S Mozambique (E Sul do Save and Lebombo Range), and E South Africa (coastal KwaZulu-Natal, including L St Lucia).
L. f. natalensis Roberts, 1922 – E & S South Africa (W & S KwaZulu-Natal S to extreme SW Eastern Cape at Plettenburg Bay).
L. f. pondoensis Roberts, 1922 – coastal forests of E Transkei (Pondoland), in NE Eastern Cape.
L. f. ferrugineus (J. F. Gmelin, 1788) – S Western Cape (E to Plettenberg Bay).



Descriptive notes. 21–23 cm; male 53–69 g and female 54–62 g (nominate and *natalensis*), male 44–53 g and female 42–51 g (*tongensis*). Male nominate race has forehead, crown, hindneck, cheek, ear-coverts, side of neck, mantle and scapulars glossy jet black; lower back feathers long, full and loose, each with indistinct whitish subapical spot, rump feathers tipped buff-rufous, uppertail-coverts black; tail glossy black; upperwing mainly black, somewhat glossy, median coverts white distally, innermost two greater coverts with broad white outer edges, innermost two secondaries with white outer edges (long white wingstripe); chin, throat and breast buffy white, merging into ochraceous rufous on flanks, thighs and lower belly and into rich cinnamon-rufous on rear flanks and undertail-coverts; underwing-coverts and axillaries cream-buff, greater under primary coverts black; iris very dark brown, eye-rim black; bill robust, black; legs slate-grey. Female is like male but duller, forehead to mantle slaty or blackish-grey, has more extensive rufous on belly, dark brown eyes. Juvenile is similar to female but with variable degree of buff and dusky mottling above and rufous barring below, bill horn-coloured; immature like adult female but rather paler and duller, rump rufescent grey, entire underside from chin to undertail-coverts buffy, a little darker towards rear. Race *pondoensis* is like nominate, but male glossier black, upperparts of female tinged olivaceous; *natalensis* resembles previous, but male whiter (less buffy) on chin, throat and breast, and flanks less richly cinnamon, female upperparts darker; *transvaalensis* is like nominate, but both sexes have chin to breast buffy white grading into pale rufous lower belly, female with upperparts dark grey; *tongensis* is small, male mainly white below, with buffy flanks, thighs, belly and undertail-coverts, female like female *natalensis* but underparts paler; *savensis* is like last but still smaller, upperparts uniformly matt dark slate-grey, flanks tawny-buff. Voice. Highly vocal; duet-singing frequent throughout day and year, with much regional variation in duration, tonal quality and duet structure; a given pair has distinctive duet pattern. Repeated fluty whistles and harsh calls, mainly in duet initiated by either sex; bird that has lost its mate can sing whole duet by itself. In territorial interactions, male utters loud, ringing "houu" whistles and female responds with higher-pitched loud "huwee" or double "huwehuwe" (nest-relief signals similar, "houu" whistle by male and "huweyo" whistle by female); in aggression and courtship, loud "boubou" whistles and snarling, clashing, nasal "tchzanaa-tchananaa" or "bizzikizzkizz" calls; contact call a repeated, low-pitched "boubou", mainly by male; frips wings in flight; pair makes "tik-tik" calls when going to roost and when plundering a nest; alarm "tik-tik", "tschok", rattles, scolds and guttural "chaa-aa-aa"; another call, of unknown function, is high-pitched "squee-squee-squee-tik-tik-tik", which can evoke similar call by mate. Mimicry of Red-chested Cuckoo (*Cuculus solitarius*) once reported.
Habitat. Dense mesic woodland, favouring clumps of leafy bushes, tangles of creepers, coastal scrub, riverine thickets, edges of forest, stands of proteas (*Protea*), thickets around base of koppies and on termitaria, plantations, exotic acacias (*Acacia*) and mature gardens.
Food and Feeding. Beetles (Coleoptera), grasshoppers (Orthoptera), hairy caterpillars up to 90 mm long, bees (Hymenoptera), many snails (of species *Helix adspersa* and *Theba pisana*); occasionally eggs, nestlings and fledglings of small birds, house mice (*Mus musculus*), geckos (of species *Phyllodactylus porphyreus*) and their eggs; in gardens, also grain, porridge and fruit. Singly and in pairs. Keeps low down in dense, woody vegetation; secretive, seldom coming into open except around human habitation. Forages by leaping, hopping and creeping in rather horizontal posture through woody tangles and undergrowth, emerging briefly at edge and then disappearing from view again; often comes to ground littered with dead plant matter but with no herbs, in shade under bushes, hopping around in search of food; sometimes comes on to edges of lawns, and visits birdtables. Pulls bark off dead trees to find geckos. Occasionally probes flowers, and hawks after

flying insects; a captive regularly impaled prey. Hairy caterpillars vigorously rubbed against branch or in sand before being consumed; stings of bees rubbed off against perch before insect swallowed; to eat snail, breaks open shell by repeatedly beating it against branch, or wedges it into crevice and uses bill to tug flesh out. One individual took whole eggs one at a time from nest of Cape Robin-chat (*Cossypha caffra*), put each on ground and ate contents and shell.

Breeding. In South Africa breeds Aug–May (mainly Oct–Dec) in N, Sept–Dec (mainly Oct–Nov) in KwaZulu-Natal, and Aug–Mar in Western Cape; Oct–Dec in Mozambique. Pair defends territory throughout year, but especially in breeding season, with repeated loud ringing whistles, mainly by male while in upright stance, bobbing head slightly and with half-open tail, half-exposed on elevated perch; in territorial interaction, rival males counter-sing, fanning tail and fluffing out white-spotted back feathers; male may fly or half-glide downwards with exaggerated, slow wingbeats, giving snarling calls with head up; pair becomes aggressive in breeding season, chasing other birds and plundering their nests. Courtship seem to be same as interactions of rival males; male and female sway, move close together through vegetation, hopping, creeping and winding through bush, fripping wings and duet-singing; in display-flight, male descends with slow, exaggerated beats, head held up and rump feathers fluffed. Nest, built by both sexes, in one case only by female (taking c. 6 days), a loosely knit bowl made of slender twigs, roots and grasses, sometimes bound with spider web and lined with finer grass and rootlets, or sometimes no twigs used (nest can be so flimsy that eggs visible from below); placed 1–8 m (usually c. 2 m) above ground in fork in dense bush, hedge or mass of creepers, or in dense foliage near end of branch, usually well concealed; occasionally in dead tree; pair destroys nest if much disturbed, and female once used the material to build another nest nearby; territory c. 3 ha. Clutch 2–3 eggs; incubation by both sexes, from first egg, period 16–17 days; eggshells eaten or (usually) carried away in bill by adult soon after eggs hatch; chicks fed by both parents, faecal sacs either swallowed immediately or carried away by adult, at one nest one or the other parent constantly brooded chicks for 11 days and both fed young thereafter, nestling period 16–17 days; at one nest, young respectively 16 days and 17 days old left nest on same morning within two hours of each other; fledglings stay in area of nest, begging from deep cover, and at 53–54 days forage for themselves but still also fed by parents; young still with parents at 80 days, by which time they have perfected adult vocal repertoire. A few nests (2%) parasitized by Black Cuckoo (*Cuculus clamosus*); parasitized rarely by Jacobin Cuckoo (*Clamator jacobinus*). One individual survived for at least 11 years.

Movements. Sedentary, pair apparently remaining in same territory for life; one individual moved 15 km.

Status and Conservation. Not globally threatened. Generally common to very common. Widespread but uncommon within small range in Botswana, where confined to Gaborone and Lobatse areas; in Zimbabwe, recorded only in small area in SE (25 km W of Marhumbini); common in S Mozambique. Widespread and locally common in N, E & S South Africa, and locally very common in Western Cape; also recorded from near Clocolan, in Free State. Adapts readily to well-wooded suburbs.

Bibliography. Aldiss & Hunter (1985), Ambrose (2000), Brewster & Tyler (2003), Clancey (1980, 1996), Cordeiro & Kiure (1995), Crane (2001), Cyrus & Robson (1980), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Earlé & Grobler (1987), Fishpool & Evans (2001), Frandsen (1982), Fry *et al.* (1988, 2000), Ginn *et al.* (1989), Hall (1954), Hall & Moreau (1970), Harcus (1977), Harris & Arnott (1988), Harris & Franklin (2000), Harrison *et al.* (1997), Hockey *et al.* (1989), Hunter (1988), Irwin (1977, 1987), Kaumanns (1975), Langley (1982, 1983), Lorber (1984), Mackworth-Praed & Grant (1963), Maclean (1993), Maclean & Vernon (1976), Markus (1972), McCarthy (2006), Monadjem (2002a, 2002b, 2003), Nguembock *et al.* (2008), North & Haagner (1966), Oatley (2003), Osborne & Tigar (1990), Oschadleus (2000), Parker (1999), Payne (1971), Priest (1948), Quickelberge (1966), Roberts (1932), Rowan (1983), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Sonnenschein & Reyer (1984), Symes *et al.* (2002), Tarboton (2001), Tarboton *et al.* (1987), Tyler *et al.* (2008), Vincent (1949), White (1962).

31. East Coast Boubou

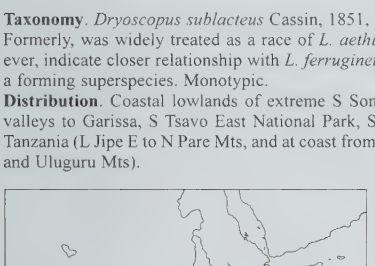
Laniarius sublacteus

French: Gonolek de Cassin **German**: Sansibarwürger **Spanish**: Bubú de Cassin
Other common names: Dimorphic Boubou

Taxonomy. *Dryoscopus sublacteus* Cassin, 1851, Lamu, Kenya.

Formerly, was widely treated as a race of *L. aethiopicus*; recent molecular-genetic studies, however, indicate closer relationship with *L. ferrugineus*, to the extent that the two can be regarded as a forming superspecies. Monotypic.

Distribution. Coastal lowlands of extreme S Somalia (Boni Forest), Kenya (inland along river valleys to Garissa, S Tsavo East National Park, S Tsavo West National Park and L Jipe) and N Tanzania (L Jipe E to N Pare Mts, and at coast from Tanga S to Zanzibar, inland to E Usambara Mts and Uluguru Mts).



Descriptive notes. 22–25 cm; male 43–50 g, female 40–55 g. Commoner morph has forehead to hindneck, lores, cheek, ear-coverts, side of neck and upperparts slightly glossy bluish-black, feathers of lower back and rump long, full and fluffy, overlying glossy bluish-black uppertail-coverts; tail black, slightly glossy, outer feathers sometimes white-tipped; upperwing black, slightly glossy, sometimes 1–3 white or whitish median and greater coverts; white below, breast and flanks tinged salmon-pink; underwing-coverts white, axillaries white with pink tinge; iris deep red-brown; bill black; legs bluish-slate. Black morph has plumage entirely glossy black. Sexes alike. Juvenile is similar to adult, but has tawny or ochre feather tips above, dull whitish below (underparts sometimes with hint of barring). Voice. Wide repertoire of croaks, snarls, tearing sounds, short "bou" notes and long whistles, often delivered by two birds in duet; like voices of *L. ferrugineus* and *L. aethiopicus*.

Habitat. Dense vegetation in highland forest and forest edge and riverbank woods, in dense cover of thickets, woody tangles in cultivated areas, coastal scrub, unkempt hedges and gardens. Mainly lowlands; to 1800 m in Uluguru Mts (E Tanzania).

Food and Feeding. Mainly insects, also small fruits and small vertebrates. Shy and retiring, foraging mainly in deep shade and dense cover low down, or often on ground. Obtains food by gleaning branches, foliage, stems and ground litter. Not known to differ markedly from *L. ferrugineus* and *L. aethiopicus*.

Breeding. Season Dec–Mar. Seemingly monogamous. Strongly territorial, defending territory vocally and by chasing. Nest a shallow, loosely knit open bowl of wispy vegetation, fine grasses and thin twigs with some spider silk, built a few metres from ground in fork of thin branch deep in twiggy bush. No further information.

Movements. Sedentary.

Status and Conservation. Not assessed. Probably not globally threatened. Only recently regarded as a distinct species, separate from the common and widespread *L. aethiopicus*. Black morph occurs mainly in NE of range, from S Somalia S to coastal E Kenya (to Lamu I, Manda I and mouth of R Tana mouth). Frequent in much of its somewhat restricted range, in some areas apparently uncommon but in others common. Inland populations probably secure, although there is increasing concern about impact of eucalypt (*Eucalyptus*) plantations and forest fragmentation on bird communities in E Usambara Mts and elsewhere; coastal populations and black-morph birds, in particular, could be at risk from tourist and residential development of beach frontage and the concomitant loss of insect-rich dense woody cover.

Bibliography. Borghesio *et al.* (2008), Britton (1980), Burgess *et al.* (2007), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Fry *et al.* (2000), Hall & Moreau (1970), Harris & Franklin (2000), John & Kabigumila (2007), Lack (1985), Lewis & Pomeroy (1989), Newmark (1991), Nguembock *et al.* (2008), Pakenham (1979), Redman *et al.* (2009), Sibley & Monroe (1990), Stevenson & Fanshawe (2002), Tyler *et al.* (2008), White (1962), Zimmerman *et al.* (1996).

32. Swamp Boubou

Laniarius bicolor

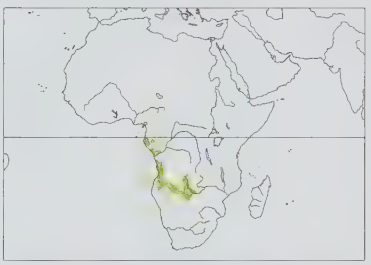
French: Gonolek à ventre blanc **German**: Sumpfwürger **Spanish**: Bubú Bicolor
Other common names: Gabon/Gaboon Boubou, Ngami Bush-shrike/Boubou

Taxonomy. *Dryoscopus bicolor* Hartlaub, 1857, Gabon.

Recent molecular-genetic analyses indicate that this species is closest to *L. ferrugineus* and *L. sublacteus*, the three composing a sister lineage to *L. aethiopicus* and *L. turatii*. Has in the past been treated as a race of *L. ferrugineus*, and sometimes considered to form a superspecies with latter and *L. aethiopicus*; but overlaps in range with *L. aethiopicus* around Chobe–Zambezi confuence, where the two occupy different habitats, and differs from *L. ferrugineus* in morphology (larger size but lighter weight, less robust bill) and in voice and habitat. Races intergrade. Three subspecies recognized.

Subspecies and Distribution.

L. b. bicolor (Hartlaub, 1857) – W Cameroon S to Gabon and extreme NW Angola (coastal Cabinda).
L. b. guttatus (Hartlaub, 1865) – PRCongo S to W Angola (S to near Lubango).
L. b. sticturus Hartlaub & Finsch, 1870 – interior of S Angola E W Zambia, NE Namibia and N Botswana.



Descriptive notes. 23–25 cm; male 52–65 g and female 45–57 g (*guttatus*), male 48–57 g and female 43–58 g (*sticturus*). Nominate race is glossy bluish-black above, including upperwing and tail, median coverts tipped white, innermost greater covert with white outer web, next two completely white; throat and underparts pure white, greater under primary coverts black, other underwing-coverts and axillaries white; iris dark brown; bill black; legs slate-blue. Sexes alike. Immature is like adult but spotted with buff above and faintly barred below, outer tail feathers buff-tipped, white wing-coverts blotched with greyish-brown. Race *guttatus* is very like nominate, but has white on outer web of one or two inner secondaries; *sticturus* is largest race, has white (3 mm wide) on outer edges of innermost three secondaries forming long white wingstripe, sometimes white tips on tail. Voice. In S of range song a synchronous or overlapping duet, male uttering soft but ringing, fluty "whhawww" or "houuu" whistle and female a grating, descending cackle, "kikikakakrrrrrr", or harsh ratchet-like rattle, "kakakakakkkk"; sometimes male's whistle higher-pitched, "whheeeeww", answered by female with "tatatrrrr". Male's whistle usually preceded by short, soft but guttural "grr" or "werk" sounds, often double. In PRCongo voice somewhat different; includes ringing, upslurred "woi-woi-woi", soft "hop-hop", repeated ringing "paw-paw-paw", and short duets "haw-kaka" with "hooee-kaka". Duetting tends to be in lengthy sequence, initiated by either sex; frequency increases as breeding season progresses. Number of strophes in ratchet call varies individually, and is greater in high-intensity interactions. Threat a harsh, loud, rapidly repeated "kawkaw..." and nasal, twanging "tchzenenene" during flight display; alarm a slowly repeated "tuk" or scolding "jik-jik-tzhaaaa" or longer "tizzh-zhizhi-zhaaaa"; discordant "tik-tik-tik" calls before settling to roost. Sometimes makes wing-fripping sounds in flight.

Habitat. In Cameroon, found in stunted mangroves with small areas of drier ground surrounded by tidal shallows and soft mud; dry coastal thickets and low secondary growth in PRCongo; in Angola, inhabits reedbeds, edges of papyrus (*Cyperus papyrus*) swamps and thickets in patches of riverine forest; in Zambia and Botswana, restricted to major river floodplains with tall reeds, dense papyrus beds, water figs (*Ficus verruculosa*), thick riverine bush, acacia (*Acacia*) thickets, riverside gardens, swamps and choked streams. Generally in densest part of vegetation.

Food and Feeding. Invertebrates, including moths and caterpillars (Lepidoptera), beetles (Coleoptera), bugs (Hemiptera) including cicadas (Cicadidae), also millipedes (Diplopoda), small worms (Annelida); a few small fruits; once a frog. Forages singly and in pairs in dense woody vegetation, low down in papyrus or in canopy of larger riverine trees. Advances in inclined posture, leaping and slipping through small branches, twisting head in search of prey. Gleans trunks, branches, foliage, and reed and papyrus stems; tends to work its way upwards in shrub or thicket, then glides down to base of adjacent clump. Often comes to ground in dry, bare and shaded areas below woody growth; on ground moves with short, bouncing hops, flicking aside bits of debris with bill. Occasionally catches insects in flight. Forages alongside *L. aethiopicus* without aggression.

Breeding. Immature in Jun in Cameroon; pairs duetting Oct–Jan and May in Gabon; eggs in Aug–Nov and Jan–Apr (mainly Nov, once Jun) in Botswana. Pair keeps all year in territory of c. 2 ha, defending it by calling; utters threat call accompanied by bowing, wing-flicking and tail-flicking. Courting male and female chase each other, keeping in tandem as they hop and bounce through vegetation (often in upper canopy of large trees), male gives drawn-out whistles and glides behind female; in territorial or courtship behaviour, two duetting birds sit upright, close together on exposed perch, each with head up and tail slightly fanned, male bobs head as he gives "grr" call and bows body when giving "houuu" whistle, female vibrates tail when she answers with ratchet call; one utters twanging calls while flying steeply down with exaggerated, slow wingbeats, head held up, rump plumage fluffed, tail fanned. Nest a neat cup or flimsy saucer made of loosely woven fine twigs and tendrils, sometimes with grass, placed 1·5–4 m above ground in *Bougainvillea* or tangled palm frond, on horizontal fork in bush or axil of palm frond. Clutch 2 eggs; incubation by both

sexes, somewhat negligently, period 21 days; nestling period 13 days. One nest parasitized by Black Cuckoo (*Cuculus clamosus*).
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common. In Cameroon, small population on coast near Tiko, and pair sighted near Bibundi, on Mt Cameroon; occurs on Gabon coast in R Ogooué mouth, Ogooué Maritime, Fernan Vaz, Port Gentil and Nyanga Districts, and quite common around Mouila and in Moukalaba-Doudou National Park; in PRCongo, common along coast of Kouilou Basin and up to 22 km inland. Common in Angola in coastal Cabinda and from coast to varying distances away from it in Zaire S to Namibe, inland to W Cuanza Norte, Huambo, N Bié and C Huila, and in Cunene valley in Cunene and probably Cuando Cubango; occurs in Cuchi and Cubango valleys downstream to Caprivi Strip (Namibia) and probably present and perhaps widespread in E Cuando Cubango and SE Moxico. Locally common in Zambia throughout Zambezi Valley above Kapanda Bridge and Mambova and W to Angola border; in SW occurs along Mashi valley, but absent between Mashi and Zambezi (in W Sesheke). In Namibia occurs in part of Cunene valley, and in Cubango/Kavango and Cuando floodplains (in Caprivi Strip). In Botswana, common in Okavango, Linyanti and Chobe river systems, and sparse at L Ngami; average density of 1–2 birds/10 ha in fringing gallery woodland at Okavango Swamps and R Linyanti. No confirmed records from Zimbabwe, although almost certainly present above Katombora Rapids.
Bibliography. Angehr *et al.* (2005), Bannerman (1939a), Benson & Irwin (1967), Benson *et al.* (1971), Borrow & Demey (2001), Britton & Dowsett (1969), Chapin (1954), Clancey (1980a), Colebrook-Robjent (1976), Dean (2000b), Dean & Le Maitre (2008), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire & Dowsett (1991), Edwards (1998), Fishpool & Evans (2001), Fry *et al.* (2000), Ginn *et al.* (1989), Hall (1954, 1960a, 1960b), Hall & Moreau (1970), Harris & Arnott (1988), Harris & Franklin (2000), Harrison *et al.* (1997), Leonard, Beel & Peters (2001), Lippens & Wille (1976), Louette (1981), Mackworth-Praed & Grant (1963, 1973), Maclean (1993), McCarthy (2006), Nguembock *et al.* (2008), Payne (1971), Penry (1994), Pollard (1992), Priest (1948), Prigogine (1984c), Pryce (1989), Quickelberge (1966), da Rosa Pinto (1966), Serle (1965), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Sinclair & Sinclair (1995), Sinclair *et al.* (2004), Skinner (2001a, 2001b), Sonnenschein & Reyer (1984), Tarboton (2001), Thorpe (1972), Torrens (2002), Traylor (1963, 1965), White (1962).

PLATE 5 ➤



PLATE 5

inches 4

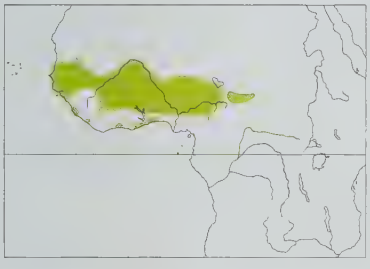
cm 10

33. Yellow-crowned Gonolek

Laniarius barbarus

French: Gonolek de Barbarie **German**: Goldscheitelwürger **Spanish**: Bubú Coronigualdo
Other common names: Common Gonolek/Boubou/Shrike, Barbary Shrike; Sierra Leone Gonolek (*helenae*)

Taxonomy. *Lanius barbarus* Linnaeus, 1766, Senegal.
Was formerly held to compose a superspecies with *L. atrococcineus*, *L. erythrogaster* and *L. mufumbiri*, some authors including *L. atroflavus* in this group. Recent molecular-genetic studies indicate that this species is sufficiently closely related to *L. erythrogaster* for the two to be regarded as a superspecies, that *L. mufumbiri* and *L. atroflavus* are a sister-group in same lineage, and that the four are only distantly related to *L. atrococcineus*. Two subspecies recognized.
Subspecies and Distribution.
L. b. barbarus (Linnaeus, 1766) – S Mauritania (mainly in Senegal valley, but N to Tagant area), Senegambia and NW Guinea E to C Mali and S Niger, and S Chad, S to Liberia (Monrovia and Congo Town lagoon), N & S Ivory Coast, Togo and Benin, N, C & extreme SW Nigeria and N Cameroon.
L. b. helenae Kelsall, 1913 – Sierra Leone coast from near Guinea border S to Bonthe.



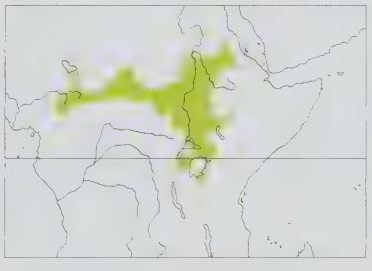
Descriptive notes. 23 cm; 44–52·5 g. Nominate race has forehead to hindneck olive-yellow, front and side of crown clearer yellow; lores, narrow line over eye, upper cheek, ear-coverts, side of neck, and upperparts, including upperwing and long tail black with dark blue gloss, some scapular feathers with concealed white mark in centre, and lower back and rump feathers with mainly concealed large white subterminal spots; uppertail-coverts glossy black; chin to belly bright vermilion-red, vent, thighs and undertail-coverts buff, with blackish wedge down from rump, separating rear flanks from undertail-coverts; underwing-coverts and axillaries black; one mated 7-year-old individual had underparts all yellow; iris dark brown; bill black; legs slate-grey or bluish-grey. Sexes alike. Juvenile has top of head mustard-yellow, upperparts uniformly dark brown, upperwing-coverts with yellowish tips, underparts ochre-yellow, side of breast, flanks and belly narrowly barred greyish-black, eyes dark brown; later, yellow feathers replaced with scattering of red ones, starting mainly on throat and lower belly. Race *helenae* differs from nominate in having forehead, crown and hindneck rufous or orange-brown, not olive-yellow. Voice. Pair utters precisely synchronized calls in duet. Commonest duet a loud, pure, resonant, liquid double "whee-u" or "kweeho" or "tyaw" whistle by one individual, partner giving dry rasping rattle or short trill of 2–4 clicks, "kikiki" or "ch-chacha", duet lasts 0·3–0·4 seconds; male and female motifs each 0·2–0·3 seconds and overlap, with auditory response time of 0·08–0·1 seconds. Male usually initiates duet with "whee-u" but female can do so with "kikiki"; apparently each sex can both whistle and rattle; some duets tripartite, "huweeu-kkkk-huweeu". Single bird commonly utters repeated rhythmic "twoo-woo" whistle. Eight pairs used eight different duet patterns, and any one pair uses several different forms of "whee-u" call. One type of duet is repeated 10–40 times, with very regular intervals of 1·16–1·70 seconds between duets, then, after pause of several seconds, pair sings series of another duet type. Contact calls in deep cover are series of up to ten rapid clicks (lasting 0·9 seconds) by one bird followed after 0·2 seconds by clicks at different pitch (lasting 0·5 seconds). In courtship flight, emits calls like sound made by winding in a fishing reel, and makes wing-fripping noise.
Habitat. Dense undergrowth in mesic and dry wooded savannas; thickets on large, old termite (Isoptera) mounds surrounded by bare soil or light grassland with only few scattered low shrubs; riverine bush, gallery-forest understorey, dense acacia (*Acacia*) woods with *Zizyphus* and other small thorn trees along watercourses, especially if plenty of woody litter on ground in shade of trees; farmland hedges, small groves of coppiced tamarinds (*Tamarindus*). Also large, mature gardens in main towns in Ghana, dense coastal scrub in Nigeria. Race *helenae* in W Sierra Leone lives in mangroves, rarely visiting adjacent coastal thickets.
Food and Feeding. Eats insects, including beetles (Coleoptera), caterpillars and large numbers of grasshoppers and locusts (Acrididae); occasionally takes small birds and nestlings. Forages singly and in pairs low down in woody growth, moving through branches and on ground in long hops or sometimes creeping; partners usually within a few metres of each other, frequently calling (whether in sight of each other or not). Often forages in canopy up to 5 m high; can spend long periods in a single large fig (*Ficus*) or *Parkia* tree with shrubby growth and vegetation litter on ground below. If undisturbed spends much time on ground, where it assumes a rather upright posture, with tail held more or less horizontally. Will also move in full sun across lawns, flicking tail with every hop. Flicks aside dry leaves and woody litter; makes short runs after insects. Flies reluctantly, and never far; moves low over open patch, with very short glide into foot of bush.
Breeding. Breeds primarily in wet season: Aug–Sept in Mauritania, Jan–Sept (mainly Jun–Aug) in Gambia; in Mali, Apr–Sept N of 13° N and Nov–Dec S of it; Apr–May in Ghana, and Jun–Aug (and once nestlings in Feb) in Nigeria. Apparently monogamous and territorial. In apparent courtship flight, gives calls with bill wide open and makes wing-fripping noise; flight display also described as involving deep, slow, stalling beats, with audible wing-snaps, accompanied by churring call like sound of squeaky bed-springs. Nest an open cup built from loosely intertwined coarse plant stems, unlined, or lined with fine tendrils and roots, placed 1·5–4·5 m up in thicket or in small soft-leaved tree in shrubby copse. Clutch 2 eggs. No other information.
Movements. Sedentary, often highly so, pair keeping to same dense thicket all year.
Status and Conservation. Not globally threatened. Common or fairly common in much of range. Frequent to common throughout Senegal and Gambia, and frequent in N Guinea-Bissau; quite common in C & S Mali, where frequent in Haut Niger National Park and common in Boucle du Baoulé National Park, and common in parts of Burkina Faso; in Niger, common in W National Park and in R Niger valley (S from Tillabéry), infrequent away from river (S from Tahoua), and in SE frequent in Komadugu-Yobé area (near L Chad). Poorly known in Guinea but likely to be widespread in N. Race *helenae* locally common in coastal Sierra Leone. Only two records in Liberia (Monrovia and Congo Town lagoon); in Ivory Coast, common N of Bouaké, scarce in S guinean woodlands, and common along dry coast from Azagny National Park E to Assinie; widespread in riverine thickets in N & C Ghana, and on coast confined to thickets from Elmina E to Accra and Keta Plains; common and widespread in N Togo, uncommon or absent in S guinean zone, and common along coast. In Nigeria, frequent and widespread in N (Sokoto and Kano Provinces and lower Komadugu Gana valley S to Ilorin and Benue valley) and present also on SW coast (Badagri E to Lagos); locally common in N Cameroon, including Waza National Park, and uncommon in Mbam-Djerem National Park; uncommon but widespread in soudanian zone in Chad, where E limits unclear. This species is too adaptable to be of conservation concern; nevertheless, long-term threats to its abundance in Hwimo area of NW Nigeria (and probably applicable also to vast swathes of its W African range) include timber-felling and shrub clearance for building and farming, the regular cutting of small trees for firewood, hunting (with guns and catapults), brushwood fires, and increasing ecological imbalance resulting from various human activities.
Bibliography. Balança & de Visscher (1997), Bannerman (1939a, 1953), Barlow *et al.* (1997), Bates (1930), Bobo *et al.* (2006), de Bont (2002), Borrow & Demey (2001), Claffey (1995), Crick & Marshall (1981), Crisler *et al.* (2003), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire & Dowsett (2005), Elgood *et al.* (1994), Fishpool & Evans (2001), Fry (1970), Fry *et al.* (2000), Fuchs *et al.* (2005), Gee (1984), Gore (1990), Greig-Smith & Davidson (1977), Grimes (1965, 1966, 1978, 1987), Hall & Moreau (1970), Harris & Franklin (2000), Hooker & Hooker (1969), Jensen, F.P. *et al.* (2008), Jensen, J.V. & Kirkeby (1980), Leisler & Winkler (2001), Louette (1981), Mackworth-Praed & Grant (1973), Morel & Morel (1982, 1988), Mundy & Cook (1972), Ndao (1989, 1999b), Nguembock *et al.* (2008), Nikolaus (2000), Payne (1970, 1971), Rodwell (1996), Salewski (2000), Scholte *et al.* (1999), Serle (1943b), Serle & Morel (1977), Shelley (1912), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Thiollay (1985), Thorpe (1972), White (1962).

34. Black-headed Gonolek

Laniarius erythrogaster

French: Gonolek à ventre rouge **German**: Scharlachwürger **Spanish**: Bubú Cabecinegro
Other common names: Abyssinian/Red-bellied Gonolek, Black-headed Bush-shrike, Barbary Shrike

Taxonomy. *Lanius erythrogaster* Cretzschmar, 1829, Kordofan, Sudan.
Was formerly held to compose a superspecies with *L. atrococcineus*, *L. barbarus* and *L. mufumbiri*, some authors including *L. atroflavus* in this group. Recent molecular-genetic studies indicate that this species is sufficiently closely related to *L. barbarus* for the two to be regarded as a superspecies, that *L. mufumbiri* and *L. atroflavus* are a sister-group in same lineage, and that the four are only distantly related to *L. atrococcineus*. Monotypic.
Distribution. NE Nigeria, S Chad, N & C Cameroon (S to Adamawa Plateau) and N Central African Republic E to E Sudan, W Eritrea and W Ethiopia, S to E DRCongo, N Tanzania and W Kenya; also in SE DRCongo (Lualaba valley from about Kabalo S to L Kisale and Bukama).



Descriptive notes. 20·5–21·5 cm; male 42–53 g, female 46–55 g. Top of head to below eye, ear-coverts, side of neck and upperparts, including upperwing and tail, are black with dark blue gloss (some individuals, especially in Lualaba valley, in SE DRCongo, have scattered yellow feathers on crown); long feathers of lower back, rump and some uppertail-coverts with large white subterminal spots (mainly concealed), rump feathers (c. 45 mm long) proximally dark grey, tip with dark grey band (7 mm deep) ending proximally in black arc (1 mm deep) and with silky white patch (6–7 mm long) at shaft; throat and underparts bright vermilion-red, vent and undertail-coverts buff, thighs variably black, red or buffish, rear flanks, vent and undertail-coverts separated by blackish area; underwing-coverts and axillaries black; iris pale straw-yellow; bill black; legs black or dark lead-grey, toes sometimes bluish-black. Sexes alike. Juvenile is blackish above, with buff feather tips on mantle to rump and upperwing coverts, dull yellowish-buff below, with narrow blackish bars from chin to vent, chin tinged pink at side, breast tinged pink, a few vermilion feathers on flanks, eyes dark brown; immature duller black above than adult, with buff tips on forehead, crown and wing-coverts, like juvenile below but patchy and mottled, with crimson banding posteriorly (beginning on lower belly). Voice. Pair sings in duet, a loud, resonant, bell-like, disyllabic "wheeyou", "hweeu", "yoick" or "tyotyo" whistle by male answered instantly by female with hiss or short, harsh, rasping "jaar", "zeeer", "tzzz" or "kssrrrrr", the combined "hweeuzeeer" sounding like song of single bird (another song involving both sexes is reported as "chuyo-chuyo-chyochochocho"); "yoick" is 0·1–0·25 seconds in duration (and quite variable in sonagram shape), hiss 0·2–0·35 seconds (but constant in shape); in eight consecutive duets by one pair, interval between initiator's calls were 2·5–5·6 seconds and second bird responded after 0·125–0·160 seconds. A three-month-old juvenile joined in with adults' duet, synchronizing precisely with female and uttering female part of duet, but at six months had developed male part of duet. Alarm a rapid, continuous chatter, "chk-chk-chk...".
Habitat. Thornbush, wooded and bushy grasslands, thick belts of woody growth along streams and lakesides, grassy river plains subject to flooding, and dense riparian scrub, especially with doum palms (*Hyphaene thebaica*); papyrus (*Cyperus papyrus*) swamps in W of range; also acacia (*Acacia*) woods, dense thickets and shrubby copses. In Uganda, dense cover in forest patches and riverine forest in sparsely wooded country, and in N also acacia thickets; leafy urban gardens in Entebbe and elsewhere in S. Mostly lowlands; to 1500 m in E of range.
Food and Feeding. Insects, including Orthoptera and caterpillars, also some small fruits; some small lizards and bird eggs taken. Forages singly and in pairs. Skulks in dense, shady vegetation, but often inquisitive and responsive; can become bold and conspicuous around Entebbe (Uganda).
Breeding. Poorly known. Season Mar and Jun–Jul in Sudan; in Uganda, Mar–Apr in N & E and Sept–Jan and Mar–Jun (mainly Apr–Jun) in W & S. Monogamous and territorial, pair keeping in territory throughout year. Nest a loosely constructed open cup made from rootlets, grass or bark fibres, lined with fine rootlets (eggs sometimes plainly visible from side and below), placed 4–8 m

On following pages: 35. Papyrus Gonolek (*Laniarius mufumbiri*); 36. Yellow-breasted Boubou (*Laniarius atroflavus*); 37. Mount Kupe Bush-shrike (*Chlorophoneus kupeensis*); 38. Bocage's Bush-shrike (*Chlorophoneus bocagei*); 39. Many-coloured Bush-shrike (*Chlorophoneus multicolor*); 40. Black-fronted Bush-shrike (*Chlorophoneus nigrifrons*); 41. Olive Bush-shrike (*Chlorophoneus olivaceus*); 42. Orange-breasted Bush-shrike (*Chlorophoneus sulfureopectus*).

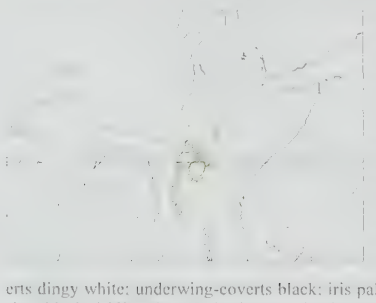
above ground in fork in middle of thick bush or in outer branch of tree, often a fig (*Ficus*). Clutch 2 eggs. No other information.
Movements. Resident; in Chad thought to move N in wet season.
Status and Conservation. Not globally threatened. In Nigeria common on shores of L Chad S to R Logone inundation zone, Waza National Park and Logomani, and common in N Cameroon S to Adamawa Plateau; in Chad common in soudanian zone and local in sahelian zone, and in Central African Republic common in Manovo-Gounda-Saint Floris National Park and uncommon in Vakaga prefecture. Common and widespread in Sudan S from W Darfur and Khartoum, and recorded near Atbara; absent from S Bahr al Ghazal and most of Western Equatoria. In Ethiopia frequent to common in NW, W & SW, and in Eritrea common along all W river valleys up to c. 900 m. In DRCongo, common in lowlands around L Albert and L Edward and in Rutshuru area; also in Lualaba valley from about Kabalo S to Bukama. Common throughout Uganda (except perhaps extreme NW) at 600–1500 m. In Kenya confined to W parts, around Lokichokio and N end of L Turkana, in Suam valley at Kongelai, and in Marich, Nasolot Nature Reserve and S Kerio valley, and recorded at Marigat and L Baringo; common in L Victoria basin E to Muhoruni and Migori, and one of commonest bird species in Ndere Island National Park (just off N shore of L Victoria). Recorded in E Rwanda and E Burundi. In Tanzania, occurs in Mara, W Serengeti National Park (where very common in Grumeti forest), and N Shinyanga and Mwanza districts, and common in extreme NW.
Bibliography. Arman (1971), Ash & Atkins (2009), Bannerman (1939a, 1953), Borrow & Demey (2001), Britton (1970), Brown & Britton (1980), Carswell *et al.* (2005), Cave & Macdonald (1955), Chapin (1954), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Elgood *et al.* (1994), Fishpool & Evans (2001), Fry *et al.* (2000), Gottschalk (2002), Gronvik (1934), Gyldenstolpe (1924), Hall & Moreau (1970), Harris & Franklin (2000), Holmes (1974), Hooker & Hooker (1969), Jackson & Sclater (1938), Leisler & Winkler (2001), Lippens & Wille (1976), Louette (1981), Mackworth-Praed & Grant (1960, 1973), Ndang'ang'a *et al.* (2008), Nguembock *et al.* (2008), Nikolaus (1987), Ottosson *et al.* (2001), Payne (1971), Salvan (1969), Scholte *et al.* (1999), Schouteden (1969), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), van Someren (1916), Stevenson & Fanshawe (2002), Thorpe (1963, 1972), Urban & Brown (1971), Verheyen (1953), White (1962), Zimmerman *et al.* (1996), Zinner (2001).

35. Papyrus Gonolek

Laniarius mufumbiri

French: Gonolek des papyrus **German**: Papyruswürger **Spanish**: Bubú de los Papiros
Other common names: Papyrus Bush-shrike, Mufumbiri Gonolek/Shrike/Bush-shrike, Yellow-crowned Gonolek(!)

Taxonomy. *Laniarius mufumbiri* Ogilvie-Grant, 1911, Mufumbiro Volcanoes = Vichumbi, Lake Edward, DRCongo.
Closely related to *L. atroflavus*, but the two are better treated as independent species, rather than as a superspecies; their closest allies are *L. barbarus* and *L. erythrogaster*, the four constituting a lineage that is sister to the cluster comprising *L. aethiopicus*, *L. turatii*, *L. ferrugineus*, *L. bicolor* and *L. luehderi*. Monotypic.
Distribution. W & S Uganda, Rwanda, Burundi, extreme E DRCongo (Vichumbi, Rutshuru), NW Tanzania, and SW Kenya (shores of L Victoria SE to Kisumu, Yala Swamp and Kendu Bay).



Descriptive notes. 17–19 cm; male 45–46 g, unsexed 34–46 g. Has forehead, crown, nape and central hindneck dull golden-yellow; lores, areas just above and below eye, ear-coverts, side of neck, and upperparts, including tail and most of upperwing black, slightly glossy; rump feathers full, soft and fluffy, with whitish tips and concealed white subterminal spots; median upperwing-coverts white with black bases, greater coverts black, innermost ones with white margin along outer web; chin and throat red with orange tinge; breast, belly and most of flanks bright pinkish-red, rear flanks black, thighs, vent and undertail-coverts dingy white; underwing-coverts black; iris pale lemon-yellow; bill black, mouth black; legs slate-black. Differs from *L. barbarus* in having white in wing, much less deep-based and robust bill, much more slender tarsus and toes, and longer and less strongly decurved claws. Sexes alike. Immature differs from adult in having forehead and crown blackish-olive, becoming black on hindneck, white spots in upperwing-coverts may include greater primary coverts, chin and throat yellowish-buff, merging to buffy pale rufous-vermilion on breast and flanks, rear flanks dusky blackish, eyes greyish-brown. Voice. Calls or sings in duet, a double, hollow, gong-like "pyo-pyop" given alone or answered with grating "zeetu" or buzzy "tzrrrr"; duet commonly of two or three high-pitched whistles, "weyo-weyo, u-u, yo-yo yoo-yo" or "yoo yong-yong", followed instantly by presumed female's single or double, harsh "u-tzeu, u-tzeu"; sometimes four-syllable "pyo-pyo-pyo-pyo" answered by similar but faster call, and "peetoo-peetoo" answered by identical call; also "tyo-wzzz" and rhythmic series of "wi-onk" or "chonk" notes with female's antiphonal harsh "chh-t-chh" notes.
Habitat. Confined to papyrus (*Cyperus papyrus*) swamps and beds, mainly the interior of large ones, beside meandering rivers and along lakeshores; inhabits pure stands of papyrus, papyrus-grass (*Miscanthus*), papyrus mixed with woody shrubs, and mosaics of floating prairie–papyrus. Mainly in lowlands and to 1600 m, but up to 2050 m.
Food and Feeding. Mainly small insects, such as myrmecine ants, beetles (including families Curculionidae, Carabidae, Elateridae and Staphylinidae), flies (Diptera), bees and wasps (Hymenoptera), caterpillars; also small snails (Gastropoda) and fruits. Singly and in pairs. Skulks in dense vegetation, occasionally making short flights over open water. Forages at all levels in papyrus, and sometimes in emergent woody shrubs; seen also at edges and along raised swamp roads.
Breeding. Very few data. Eggs in Jun, Sept–Dec (mainly Sept) and Feb in Kenya; sings Feb–Mar. Doubtless territorial; once seen to chase *L. erythrogaster* at edge of papyrus swamp. Nests found but not described. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Recent population estimate of c. 2,000,000 adults. Thought to be potentially at risk owing to its specialized, restricted habitat. Locally common in Uganda at 1100–1600 m; widespread in S & W Lango and L Kyogo to Ankole and Kigezi, shores of L Victoria from Masaka to Kenya border. Widespread and locally abundant in E Rwanda and E Burundi; in NW Tanzania, occurs in middle Akagera basin and along R Ruvubu and in Malagarazi basin (on Burundi border) to c. 4° S. Locally common in Kenya, where seven individuals mist-netted (two singing) in 15 months in 1-ha plot at Kadenge. Estimated density of 6–10 birds/ha at site in Kenya; in Uganda, 13 birds/ha in centre of undisturbed swamp but less than 1 bird/ha in polluted and degraded swamps. Abundance directly related with height and density of papyrus, with numbers larger in taller and denser stands. Even though not immediately at risk, this species requires monitoring. Many papyrus marshes on shores of L Victoria are suffering from adverse effects of increasing human population, intensification of fishing and agriculture, burning, papyrus-harvesting, cattle grazing, goat browsing, pollution and falling water levels (level in L Victoria has fallen by c. 1 m in last decade); to what extent such changes are being monitored and management policies implemented is uncertain.
Bibliography. Anon. (2008d), Britton (1970, 1978), Butchart & Stattersfield (2004), Carswell *et al.* (2005), Collar & Stuart (1985), Collar *et al.* (1994), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Fishpool & Evans (2001), Fry *et al.* (2000), Hall & Moreau (1970), Harris & Franklin (2000), Jackson & Sclater (1938), Leisler & Winkler (2001), Lewis & Pomeroy (1989), Lippens & Wille (1996), Mackworth-Praed & Grant (1960), Maclean *et al.* (2003), Marks *et al.* (2003), Nguembock *et al.* (2008), Owino (2005), Owino & Oyugi (2008), Schouteden (1969), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), van Someren (1922), Stattersfield & Capper (2000), Stevenson & Fanshawe (2002), Thorpe (1972), Vande weghe (1981a, 1981b, 1992), White (1962), Zimmerman *et al.* (1996).

36. Yellow-breasted Boubou

Laniarius atroflavus

French: Gonolek à ventre jaune **German**: Gelbbauchwürger **Spanish**: Bubú Pechigualdo
Other common names: Mountain Gonolek, Yellow-breasted Shrike

Taxonomy. *Laniarius atroflavus* Shelley, 1887, Mount Cameroon, Cameroon.
Closely related to *L. mufumbiri*, but the two are better treated as independent species, rather than as a superspecies; their closest allies are *L. barbarus* and *L. erythrogaster*, the four constituting a lineage that is sister to the cluster comprising *L. aethiopicus*, *L. turatii*, *L. ferrugineus*, *L. bicolor* and *L. luehderi*. Birds from Mt Oku (Cameroon) described as a geographical race, *craterum*, on account of slightly greater size, but size variation of species is clinal. Monotypic.
Distribution. SE Nigeria (Obudu Plateau, Mambilla Plateau, Chappal Hendu) and W Cameroon (Bamenda Highlands, Mt Manenguba, Mt Cameroon).



Descriptive notes. 18–20 cm; 40–47 g. Top of head down to lores, below eye and ear-coverts, and upperparts, including upperwing and tail, are black with very dark blue or oily green gloss; upper rump feathers black with concealed large white subterminal spots, lower rump feathers broadly buff-tipped and long (overlying uppertail-coverts); chin and throat lemon-yellow, grading to brilliant orange-yellow on breast, flanks and side of belly, middle of belly white with buff-pink tinge, thighs and undertail-coverts buffy white; marginal wing-coverts oily black, lesser and greater under primary coverts blackish, greater underwing-coverts buff, axillaries lemon-yellow; iris dark brown; bill black; legs slate-black. Sexes alike in plumage, female perhaps slightly larger than male. Juvenile undescribed; immature like adult but upperparts with dark brown wash, wings dark brown, greater primary coverts have buff tips and outer two pairs of tail feathers long buff tips. Voice. Very noisy, with wide repertoire of loud whistling, swishing, rattling, harsh grating, explosive stuttering notes and duetting. Pair duets loudly with "whee-oo-chook" or "hweeu-kzzr-hweeu", the "whee-oo" thought to be given by male and clicking "chook" or tearing "kzzr" by female, interval between the two can be as little as 0·145 seconds; initiated by either sex; sings sometimes in canopy, birds often in sight of each other, invariably approaching tape recorder on hearing playback and continuing to duet. Male also has ringing "quik-quik-quik", prolonged series of "hweeu" calls, and "quelch" instantly answered by female's "ich". Many calls similar to, and some inseparable from, those of *L. poensis*. Makes bill-clashing sounds like those of *Chlorophoneus* bush-shrikes.
Habitat. Dense undergrowth of clearings and secondary scrub in and near montane forest, and low undergrowth in small remnant forest patches and bamboos in ravines and on ridges; also in topmost branches of figs (*Ficus*), wind-shaped bushes on highest peaks, in bramble, heath, bracken and tiny remnant copses and thickets around villages, including those on bleakest hilltops. Forages in slightly more open situations; retreats into deep shade in dense vegetation if disturbed. At 700–2900 m.
Food and Feeding. Insects. Forages actively in pairs, restless and skulking; never flies far. Forages in gloomy woodland with old trees covered with moss and lichen, and in small flowering shrubs (e.g. *Agauria salicifolia* and *Hypericum*). Gleans foliage and branches in undershrubs and trees, searching up to 7 m above ground.
Breeding. Season Nov–Mar, breeding completed by late Mar. Territory advertised by duetting song and whistle calls; bird bows forward when whistling. Nest described both as neatly woven and as badly constructed, a rather flimsy, shallow cup made of coarse dry tendrils, lined with fine hair-like fibres and roots; sited 0·6–4 m (once 10 m) above ground, deep in undergrowth such as bushes, bracken and brambles. Clutch 2 eggs. No further information.
Movements. Sedentary; pair regularly duets and stays in same spot year after year.
Status and Conservation. Not globally threatened. Restricted-range species: present in Cameroon Mountains EBA. In Nigeria not uncommon on Obudu Plateau; single record in Mambilla, but common on Chappal Hendu in adjoining Gashaka-Gumti National Park. Abundant on SE flanks of Mt Cameroon at 1500–2100 m and on S flanks at 1300–2300 m, frequent to common down to lower range at 700–1300 m; common on Mt Manenguba at 1950–2250 m; widespread in Bamenda Highlands; in Kilum-Ijim area, density in seven vegetation types 2·23–2·68 birds/ha; very abundant on Mt Oku at 2000–2900 m, where the seventh commonest bird species, and so abundant in Big Babanki (27 km SW of Mt Oku) that it can be seen or heard constantly; frequent to common around L Bambulue, in Bafut-Ngemba Forest Reserve, Bali-Ngemba Forest Reserve, Santa, Sabga Pass, Mbengwi-Tinachong at 1800 m, Bamboutos Mts at 2000–2600 m, Wum, Mt Lefo and Banso Mts; occurs also on Tchabal Waddi, Tchabal Mbaba (Genderu) and between there and Banyo. Deforestation and forest degradation continues to take place in submontane parts of this species' range; whether it is consequently any less numerous than it formerly was is not known, but seems probable.
Bibliography. Bannerman (1939a, 1951, 1953), Bates (1926, 1930), Borrow & Demey (2001), Collar & Stuart (1985), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire & Dowsett (1989), Eisentraut (1973), Elgood *et al.* (1994), Fishpool & Evans (2001), Forboseh *et al.* (2003), Fry *et al.* (2000), Grimes (1976a), Hall & Moreau (1970), Harris & Franklin (2000), Leisler & Winkler (2001), Louette (1981), Mackworth-

Praed & Grant (1973), Maisels & Forboseh (1999), Mills & Cohen (2004), Nguembock *et al.* (2008), Reif *et al.* (2007), Sedláček *et al.* (2007), Serle (1950, 1965), Serle & Morel (1977), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Stuart (1986), Thorpe (1963, 1972), White (1962), Wilson (1987), Young (1946).

Genus *CHLOROPHONEUS* Cabanis, 1851

37. Mount Kupe Bush-shrike

Chlorophoneus kupeensis

French: Gonolek du Kupé **German**: Halsbandwürger **Spanish**: Bubú del Kupé
Other common names: Kupé (Mountain)/Serle's Bush-shrike

Taxonomy. *Chlorophoneus kupeensis* Serle, 1951, Kupé Mountain, Kumba Division, Cameroon.
Genus sometimes subsumed in *Malaconotus* or in *Telophorus*. Affinities of this species obscure; appears intermediate between latter genus and present one in size and bill size (but underwing pattern like *Malaconotus*), has palate orange, not black (as other bush-shrikes), and voice more like that of a babbler (Timaliidae) than that of a bush-shrike. Perhaps best allocated its own monotypic genus, pending study and clarification of its characters. Monotypic.
Distribution. Extreme SE Nigeria (NE Cross River National Park) and uplands of SW Cameroon.



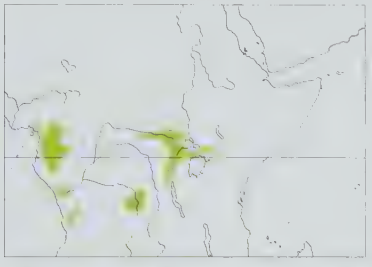
Descriptive notes. 17·5–21·5 cm. Occurs in two plumage morphs, possibly sex-related but this unlikely. "Necklace morph" (previously thought to be male) has black forehead, lores and ear-coverts, grey crown with paler side, grey nape, hindneck and mantle, bright olive-green back, rump, uppertail-coverts and tail; upperwing mostly bright olive-green, inner webs of remiges blackish, outer primaries fringed yellowish-olive at base, outer primary all black; chin and throat white, blackish-maroon line or row of three or four spots on lowermost throat (line thicker in middle); breast, upper flanks and upper belly grey, rear flanks olive-green, thighs olive, bright yellow patch on rear belly, bright yellow vent and undertail-coverts; iris violet; bill black, four long rictal bristles on each side, palate orange or yellow; legs grey. "Spot morph" (previously thought to be female) is like necklace morph, but has only one dark maroon or metallic purplish-black rounded spot (6 mm in diameter) on centre of throat, with thin line of white between it and breast; lower belly and undertail-coverts pale greenish-yellow. Sexes probably similar. Juvenile is poorly known; single museum specimen, a female, is like adult necklace morph, but forehead, side of neck and side of throat tinged green, grey of upperparts flecked with olive-green, chin and middle of throat flecked with pale yellow, narrow line of yellowish-brown spots below throat, breast patchily greenish, larger area of olive on flanks. Voice. In Cameroon, two presumed territorial males by L Edib, each accompanied by a presumed female (silent), sang loud, short chatter, "thec-thec-kh-kh-kh", followed by 3–4 "tchraaa-tchraaa-tchraaa" notes at rate of 2 per second; up to 29 "tchrraa" notes in a faster series (3 notes per second) by bird flying overhead in response to tape playback; rarely, a distinctive song of three ascending, detached whistles (sounding discordant), repeated up to six times. Song uttered regularly in response to tape playback. Other vocalizations include loud, rapidly fluctuating nasal whistle, also a clear liquid "crooa" whistle, rising and falling in pitch, singly or in series of up to four; also a series of harsh, accelerating "tic" notes ending with richer but husky, scalding notes, "tic tic tic tic tic tic tic cheeow cheeow cheeow"; quiet, continuous insect-like grating ascribed to this species seems to be rare. Angry male makes noisy snapping of wings in flight, 4–6 snaps in a series, again responding to playback; wing-snaps like those of *Dryoscopus* and differ from courtship wing-fripping of several congeners and of *Malaconotus* species.
Habitat. Primary forest with relatively open understorey, sometimes on steep hillsides; at 930–1550 m.
Food and Feeding. Insects, including beetles (Coleoptera), grasshoppers (Orthoptera) and caterpillars. Forages usually 3–4 m above ground, sometimes down to 0·5 m and up to 18 m; on Mt Kupé mostly at heights of 1–6 m, but occurs almost to top of canopy; mainly above 10 m in Bakossi Mts; occasionally comes to ground (where one killed in a snare at Kodmin, in Bakossi Mts). Moves slowly and deliberately through dense leafy growth, diligently searching foliage; has been seen to hang sideways on vertical stems and then launch itself vertically upwards to seize prey in bill, before falling back to perch. Sometimes hawks flying insects. Large prey items held in the bill and beaten against branch. Forages singly and in pairs; readily joins mixed-species flocks, which may take it into smaller trees.
Breeding. No information. Pairs seem to be territorial.
Movements. Resident.
Status and Conservation. ENDANGERED. Restricted-range species: present in Cameroon Mountains EBA. In Cameroon, occurs on Mt Kupé, in Bakossi Mts and in S Banyang Mbo Wildlife Sanctuary; possibly also on Mt Cameroon. Uncommon on Mt Kupé, where forest only c. 21 km² in extent in late 1950s; discovered there in 1951, not located during extensive searches in 1984, but was found again in 1989 at 1220–1310 m, and 39 sightings in 1990–1994; in Mar–May 1997 up to four birds seen six times, and perhaps no more than seven pairs present near Max's Trail and Shrike Trail (together c. 8 km long). Found in Bakossi Mts in 1992, and often encountered at 1150–1200 m near Kodmin, L Edib and Messaka; population possibly only c. 50 pairs; suitable forests in Bakossi are eight times greater in extent than those on Mt Kupé, and this species could possibly occur also on Mt Mwenzekong and Mt Ekomane and on lower S slopes of Mt Manenguba and Mt Nlonako, although searches on lower slopes of Mt Nlonako in 1999 and Mt Manenguba in 2000 both unsuccessful. Discovered in Banyang Mbo Wildlife Sanctuary, extending from Bakossi Mts, in 1999. Concern for this species' survival in the face of continuing forest destruction led to the setting-up in 1991 of Mount Kupé Forest Project (by BirdLife International), which involves local communities in education, forest conservation and development of ecotourism; nevertheless, some forest was lost at 1250 m on Max's Trail in 1998. In 2004–2005, this species found to be present in NE Cross River National Park, in SE Nigeria, but status there not known.
Bibliography. Anon. (2008d), Bannerman (1939a, 1953), Borrow & Demey (2001), Bowden (2001), Bowden & Andrews (1994), Butchart & Stattersfield (2004), Cohen & Mills (2002a, 2002b), Collar & Stuart (1985), Collar *et al.* (1994), Demey (1997, 1998, 1999, 2003, 2005), Demey & Kirwan (2000), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire (1999, 2004), Dowsett-Lemaire & Dowsett (1989, 1998b), Fishpool & Evans (2001), Fry *et al.* (2000), Gibbons (1995), Hall & Moreau (1970), Harris & Franklin (2000), Louette (1981), Mills & Cohen (2004), Serle (1951), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Stuart & Jensen (1986), White (1962), Williams (1998).

38. Bocage's Bush-shrike

Chlorophoneus bocagei

French: Gonolek à front blanc **German**: Bocagewürger **Spanish**: Bubú de Bocage
Other common names: Grey/Grey-green Bush-shrike

Taxonomy. *Laniarius bocagei* Reichenow, 1894, Yaoundé, Cameroon.
Genus sometimes subsumed in *Malaconotus* or in *Telophorus*; also, present species has been placed in *Dryoscopus* and *Laniarius*. May be closely allied with *C. olivaceus*. A specimen from Entebbe (Uganda), named as *C. andaryae*, was probably a hybrid between present species and *C. sulfureopectus*. Proposed race *ansorgei* (described from N'dalatando, in NW Angola), supposedly with slightly paler back, treated as synonym of nominate. Two subspecies recognized.
Subspecies and Distribution.
C. b. bocagei (Reichenow, 1894) – SE Nigeria (Obudu Plateau) and S Cameroon S to NW Angola.
C. b. jacksoni (Sharpe, 1901) – NE & SC DRCongo, Uganda and W Kenya.



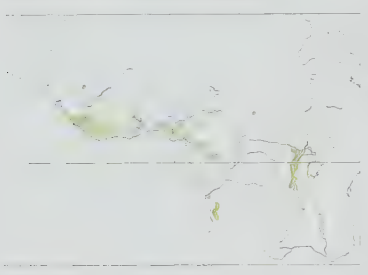
Descriptive notes. 23–25·5 cm; male 27–28 g, female 22–28 g. A small bush-shrike, dark above, with small bill and graduated or strongly rounded tail. Male nominate race has white forehead, lores, superciliary stripe, chin and throat; jet-black crown, ear-coverts and hindneck; dark slaty-grey upperparts and upperwing; tail black, small white tips on all except central two feather pairs; underparts white with ochre-buff tinge, breast sometimes buffy; underwing-coverts and axillaries white; iris dark red-brown; bill black; legs slate-grey. Female is like male, but tail greyish, eyes dark brown (not reddish). Juvenile has grey upperparts finely barred dull blackish, pale lores and supercilium, blackish mask, grey wings and tail, upperwing-coverts tipped pale yellow, each with subterminal black bar, secondaries tipped buff, underparts dirty white or yellowish-white with fine, faint dark grey vermiculations, mouth orange; subadult less boldly pied than adult, crown, nape and ear-coverts dull blackish, tail brownish-black, underparts greyish white, upperwing-coverts and secondaries with small white tips, flight-feathers edged olive. Race *jacksoni* differs from nominate only in that female has a black (not dark grey) tail. Voice. Male song variable, a sharp, ringing, upslurred "tp-tooi-tweeee", a clipped "tewp-tewp-tewp", often a repeated series of four syllables, "wewewewit", or of two syllables, "po-hee" or "peee-u", and faster clipped "tyo-tyo-tyo-tyo-tyo-tyo-tyop" (6 or 7 notes); main advertising song of clear rapid whistles, quite high-pitched and sometimes repeatedly monotonously, pitch, number of notes and rate of delivery varying; one song, "kuli-kuli-kuli-kuli-kuli-kuli-kuli", very like that of African Yellow Warbler (*Chloropeta natalensis*). Male and female perform duets: male gives up to seven (usually four) clear loud "doi" notes like those of *Telophorus viridis*, female immediately replies with harsh, tearing "zreeekk, tzrrrerr" or shorter "zzerr-wik" notes like those of Chin-spot Batis (*Batis molitor*); or male utters liquid trill followed by female's nasal "nyaaaa"; or one bird gives liquid "tiplee, tiplee", a second answers with "nyaaaa" and a third with "wizzzz".
Habitat. Fairly open wooded country with large-crowned trees (e.g. *Albizia* and *Pentaclethra*) scattered irregularly among bushes and shrubs; tall secondary forest with dominant swathes of mimosaceous plants; cocoa and coffee plantations with closed canopy, again with plenty of Mimosaceae; old second growth bordering clearings, and gallery forest e.g. in brachystegia (*Brachystegia*) woodland; also park-like gardens around large houses, leafy suburbs, and thickets with parasol trees at borders of cultivation. Rarely in primary forest. Mainly in lowlands; to 2200 m in E Africa.
Food and Feeding. Eats insects, especially caterpillars, also beetles (Coleoptera), termites (Isoptera) and grasshoppers (Orthoptera), mantids (Mantidae), cicadas (Cicadidae); also some berries. Butterflies and moths (Lepidoptera) and larvae fed to nestlings. Generally in pairs. Forages in foliage in middle and upper levels of trees, 8–20 m above ground, and sometimes in tops of very tall trees; moves slowly and deliberately through thick foliage. Elusive and skulking, except when exploiting emerging termites.
Breeding. Few details. Season Sept in Cameroon, and sings all year (especially Nov–Feb) in Gabon; breeds Aug–Sept in DRCongo and Feb, Jul and Aug in Uganda. Pair lives in territory of c. 2 ha, advertised with singing by male and duetting by pair. Nest a shallow but strong open cup made entirely from interwoven dry vine tendrils, placed in fork high in tree. Clutch 2 eggs; incubation apparently by both sexes. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Rare or uncommon to locally common. Recent record from Nigeria at Belekiti, on Obudu Plateau. Widespread in S Cameroon W to Mbulu Forest (near Nigerian border) and N to Mbam-Djerem National Park; one or two encountered on one-third of 70 2·5-km circuits of N suburbs of Yaoundé in 21 months in 1993–1995. One record in Rio Muni; in Gabon, quite common around Makokou but absent from Lopé National Park; in PRCongo, frequent in parts of Mayombe and scarce in Odzala National Park. In Angola, not uncommon in Cuanza Norte and Malanje (S to Canhoca and N'dalatando), frequent around Camabatela, and scarce in Cabinda. In DRCongo, scattered records in S Kasai Oriental, but widespread in E from upper R Lulu and Garamba National Park S to Itombwe Highlands at 1100–1670 m. Locally common in W & S Uganda at 1100–2200 m, but scarce S of Mabira Forest; uncommon in Nandi and Kakamega Forests, in W Kenya. E African range possibly contracting, since formerly occurred in Kenya SE to Kericho and Nyarondo; appears to be extinct in Rwanda, where recorded in the past. Although this species is doubtless eliminated locally as a result of woodland clearance, it is probably not adversely affected by replacement of primary forest and woodland with tree plantations and woody secondary growth.
Bibliography. Bannerman (1938, 1939a, 1939b, 1953), Bates (1911, 1930), Bobo *et al.* (2006), Borrow & Demey (2001), Bowden (2001), Brosset & Érard (1986), Brown & Britton (1980), Carswell *et al.* (2005), Chapin (1947, 1954), Dean (1974a, 2000b), Demey (2005, 2006, 2007), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire (1997b), Dowsett-Lemaire & Dowsett (1998a, 1999), Fishpool & Evans (2001), Friedmann (1937), Friedmann & Williams (1970), Fry *et al.* (2000), Grant & Mackworth-Praed (1946), Hall & Moreau (1970), Harris & Franklin (2000), Jackson & Sclater (1938), Lippens & Wille (1976), Louette (1981), Mackworth-Praed & Grant (1973), McCarthy (2006), Nguembock *et al.* (2008), Prigogine (1971), Quantrill & Quantrill (1998), Rand *et al.* (1959), Redewald *et al.* (1994), Sargeant (1993), Schouteden (1969), Serle (1950, 1952a), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), van Someren (1916), Traylor (1963), White (1962), Zimmerman *et al.* (1996).

39. **Many-coloured Bush-shrike**

Chlorophoneus multicolor

French: Gonolek multicolore **German**: Vielfarbenwürger **Spanish**: Bubú Multicolor
Other common names: Four-coloured Bush-shrike

Taxonomy. *Laniarius multicolor* G. R. Gray, 1845, no locality = Accra, Ghana.
Genus sometimes subsumed in *Malaconotus* or in *Telophorus*. Forms a superspecies with *C. nigrifrons* and possibly conspecific with it. Occurs in five basic colour morphs with additional six variants, present in varying proportions throughout range and interbreeding freely. Although geographical variation partly obscured by polymorphism, several characters enable differentiation of races. Three subspecies recognized.
Subspecies and Distribution.
C. m. multicolor (G. R. Gray, 1845) – SW Mali, Sierra Leone, SE Guinea and Liberia E, discontinuously, to W Cameroon.
C. m. batesi Sharpe, 1908 – patchily S Cameroon, NE Gabon, NW & SW PRCongo, NW Angola, Central African Republic, NE DRCongo (Ituri) and W Uganda (Kibale).
C. m. graueri (E. J. O. Hartert, 1908) – montane forests of E DRCongo (Kivu S to Itombwe), SW Uganda and W Rwanda (Nyungwe).



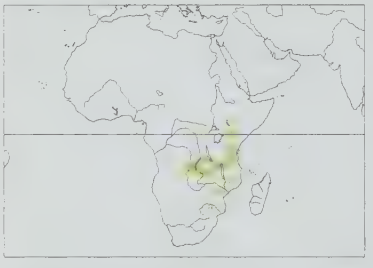
Descriptive notes. 18–20 cm; male 43–61 g and female 46–54 g (nominate), male 38–41 g and female 36–39 g (*batesi*), male all 41 g and female 36–39 g (*graueri*). Polymorphic; five principal colour morphs and a further six quantifiable variants or intermediates occurring in varying proportions throughout range; in most regions two or three morphs occur together and interbreed, but seemingly only one morph in Angola; a pair often composed of different morphs. Male nominate race yellow morph has well-defined broad black mask from forehead to side of neck; hindcrown to upper mantle grey, paling to white on forecrown and supercilium (amount and brightness of white variable, forecrown and supercilium sometimes grey); rest of upperparts green; tail feathers green, grading to blackish distally, with broad yellow tips (c. 10 mm deep on central rectrix, increasing to c. 15 deep on outermost), tail darker in W Cameroon (all morphs) than farther W; flight-feathers dark brown with green outer webs, secondaries and inner primaries tipped yellow, borders of inner webs bright yellow, tertials green with yellow tips, alula and upperwing-coverts green; cheek to chin, throat and upper breast bright orange-yellow, rest of underparts bright yellow, underside of tail blackish, underwing-coverts and axillaries bright yellow; iris blue-green, bright violet or purple; bill black; legs bluish to brownish-grey. Scarlet morph differs in having chin to lower breast scarlet, rest of underparts yellow, often with orange tinge, tips of tail feathers orange-yellow. Black-and-yellow morph has chin to upper breast black (continuous with black face mask), sharply demarcated from bright yellow on rest of underparts. Black-and-red morph is like preceding morph, but has belly, flanks and undertail-coverts red. Female of all morphs differs from male in having forehead and lores to ear-coverts grey (not black), fainter greyish-white supercilium behind eye, tail greenish both above and below and with yellow tips; yellow morph bright yellow below, but lacks orange tinge on throat and breast; scarlet morph more orange-red below than male, the colour restricted more to throat and upper breast. Juvenile has forehead to lores and ear-coverts grey; indistinct paler supercilium, top of head to upper mantle grey with dark grey barring, rest of upperparts green with yellowish barring, tail like adult female, wing like adult but alula fringed yellow and all upperwing-coverts tipped yellow, chin to upper breast, flanks and thighs barred yellowish and dark grey, lower breast to undertail-coverts yellow; juvenile plumage replaced probably rapidly by unbarred immature plumage, both sexes then like adult female but retain yellow-tipped juvenile wing-coverts. Races differ mainly in amount of white on forecrown, depth of green on tail, extent of yellow at tail tip, also in weight, bill size and degree of sexual disparity: *batesi* male yellow morph has forecrown and side of crown always white, and more distinctly so than in whitest individuals of nominate, tail black (not green) above with yellow tips, occurs also in scarlet morph with entire underparts scarlet and tail feathers tipped reddish-yellow, female differs from nominate female in having whiter forecrown and supercilium; *graueri* male has white on head as in nominate, tail black like previous, differs further from others in having buff morph, with whole underparts pale cinnamon-buff (occurs also in yellow and scarlet morphs). Voice. Male song a short, hollow whistle, "hoh" or "whoup", sometimes disyllabic, "huwo", "hooui" or "hohoh", repeated on same pitch every 3–4 seconds, duration of note and repetition rate vary, and disyllabic note may have low and high parts ("whoo-op" or "fu-fee"), some with terminal inflection ("huolo"); female responds in duet with low-pitched coughing "hoh-gah" or drawn-out rasping "kzzrrr", and duet thus sounds like "hooi-kzrrr". In Rwanda, male's short "woh" is repeated at intervals of 2–3 seconds, and a fast "fufufufufufufu" uttered usually only once.
Habitat. Primary lowland and submontane rainforest, to 1100 m in W Africa (Mt Nimba, Mt Cameroon) and to 2500 m in E (Itombwe, in E DRCongo); inhabits matted tangles of creepers and lianas festooning canopy and undercanopy of forest. Found also in forest with dense bushy growth in abandoned slash-and-burn patches, dense vegetation near villages, thick secondary growth in clearings, old secondary forest, forest–grassland mosaic, gallery forest and swamp-forest.
Food and Feeding. Insects, often large ones, including grasshoppers (Orthoptera), mantises (Mantidae), stick-insects (Phasmida), bugs (Hemiptera), beetles (Coleoptera), ants, bees and small and large wasps (Hymenoptera), moths and caterpillars (Lepidoptera). Forages among dense tangles of lianas, in epiphytes and on mossy limbs of large trees, in Liberia at 8–30 m above ground but in Gabon at 2–10 m. Hops and creeps about in crouching posture, gleaning from trunks, branches, matted creepers and thick foliage, gradually working upwards in tree. Occasionally hawks insects in air. Singly and in pairs, and in Itombwe (DRCongo) parties of up to eight individuals recorded; often joins mixed foraging flocks of drongos (Dicruridae), Old World orioles (Oriolidae), cuckoo-shrikes (Campephagidae), bulbuls (Pycnonotidae), batises (*Batis*), weavers (Ploceidae) and squirrels (Sciuridae).
Breeding. Assorted evidence of breeding in Jul–Jan and Mar–Apr in Liberia, roughly Oct–Apr in Gabon and Angola, about Dec in Uganda, and in Jan, Mar–Jun and Sept in E DRCongo (Itombwe). No other information.
Movements. Generally sedentary; in Mali a visitor in May–Jun wet-season.
Status and Conservation. Not globally threatened. Locally common. Very patchily distributed, but shy, skulking and unobtrusive; may have more continuous range than is currently realized. In Mali, frequent breeding visitor in S (N to Baoulé). In Sierra Leone, frequent in S and probably throughout; frequent on Ziama Massif, in S Guinea. Fairly widespread in Liberia, where frequent to common in at least 60 localities; density (estimated from calls at Zwedru) 3–9 pairs/km², and total population estimated at c. 200,000 pairs. Uncommon in Ivory Coast, where recorded from Taï to Lamto, Yapo, Maraoué and Comoé. In Ghana, formerly not uncommon at Accra, Cape Coast and Mampong (Ashanti), Kumasi, Makessim, in interior of "Fantee" and at Agomé Tongwe, but recent records only from Akropong (Akwapim) and Amedzofe. Uncommon in Togo, but several recent records around Misahöhe; not known to occur in Benin, although 19 corpses found in Cotonou's largest traditional-medicine market on one day in 2002 (origin uncertain). In Nigeria, found mainly in SW, also at Kagoro and in Gashaga-Gumti National Park. Not uncommon in S & extreme W Cameroon; in Central African Republic known from Lobaye Prefecture, and Manovo-Gounda-Saint Floris and Bamingui-Bangoran National Parks. Scarce in Mbini; frequent in Gabon between Makokou and Mékambo, but not yet found in Lopé National Park; in PRCongo, found only in Odzala National Park, where very local, and in SW, where frequent in Kouilou Basin; fewer than ten records in Angola. Apparently absent from DRCongo except E, where frequent W of L Albert from R Nepoko and Medje S to Ituri and Itombwe; in Uganda, known only from Kibale, Budongo and Bwindi Impenetrable Forest at 1500–1600 m; in Rwanda, recorded only in W Nyungwe Forest, where common to 2000 m and uncommon at 2000–2500 m. Comparative prevalences of morphs vary regionally: from Sierra Leone E to Togo scarlet morph most frequent (80%), followed by yellow (10%), black-and-yellow (6%) and black-and-red (4%); in Nigeria and W Cameroon, scarlet 44%, yellow 46%, black-and-yellow 8·5%, black-and-red 1·5%; in Kumba and Ekona areas of W Cameroon, scarlet 46%, yellow 27%, black-and-yellow 27%; in rest of Cameroon and Gabon, scarlet 67%, yellow 33%; in NW Angola, yellow 100%; in DRCongo, scarlet 73% and yellow 27% (Ituri), scarlet 23%, yellow 64% and buff 13% (W of L Edward), and scarlet 6%, yellow 74% and buff 20% (NW of L Tanganyika).
Bibliography. Adjakpa *et al.* (2002), Allport *et al.* (1989), Bannerman (1939a, 1953), Bates (1911), Bennun & Njoroge (1999), Borrow & Demey (2001), Bowden (2001), Brosset & Érard (1986), Brown & Britton (1980), Carswell *et al.* (2005), Chapin (1947, 1954), Colston & Curry-Lindahl (1986), Cordeiro & Githiru (2000), Dean (2000b), Dowsett (1990), Dowsett & Dowsett-Lemaire (1993, 1997), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire (1989, 1997a), Dowsett-Lemaire & Dowsett (1991, 1999), Elgood *et al.* (1994), Fishpool & Evans (2001), Friedmann & Williams (1968), Fry *et al.* (2000), Gartshore (1989), Gatter (1997), Hall (1960a), Hall & Moreau (1970), Hall *et al.* (1966), Halleux (1994), Harris & Franklin (2000), Jensen & Brøgger-Jensen (1992), Lamarche (1993), Lippens & Wille (1976), Louette (1981), Mackworth-Praed & Grant (1960, 1973), Moreau & Southern (1958), Prigogine (1953a, 1953b, 1971), Schouteden (1963, 1969), Serle (1950, 1952a), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Thiollay (1985), Traylor (1963), White (1962).

40. **Black-fronted Bush-shrike**

Chlorophoneus nigrifrons

French: Gonolek à front noir **German**: Graustirnwürger **Spanish**: Bubú Frentinegro

Taxonomy. *Laniarius nigrifrons* Reichenow, 1896, Marangu, Kilimanjaro, Tanzania.
Genus sometimes subsumed in *Malaconotus* or in *Telophorus*; present species has been placed also in genus *Laniarius*. Forms a superspecies with *C. multicolor* and possibly conspecific with it. Occurs in five main colour morphs. Three subspecies recognized.
Subspecies and Distribution.
C. n. nigrifrons (Reichenow, 1896) – mountains of E Uganda (Mt Elgon), Kenya, Tanzania and N Malawi.
C. n. manningi (Shelley, 1899) – E Angola, SE DRCongo (Katanga) and N Zambia.
C. n. sandgroundi Bangs, 1931 – S Malawi, Mozambique, E Zimbabwe and N South Africa (Limpopo Province).



Descriptive notes. 18–19 cm; male 28–40 g, female 25–42·5 g. Polymorphic; males occur in four colour morphs and females in three. Male nominate race yellow morph has black forehead, lores, upper cheek and ear-coverts, dark grey crown to upper mantle and side of neck, and dark green remaining upperparts, including upperwing and tail, outer four pairs of rectrices with yellow tips c. 4 mm deep; lower cheek, chin, throat and underparts yellow, tinged golden on breast, tinged greenish on belly and undertail-coverts, flanks greenish with faint darker barring, underwing-coverts and axillaries bright yellow; in Songea (S Tanzania) underparts duller yellow, washed coppery, on Ufipa Plateau (SW Tanzania) breast golden-brown; iris red-brown or crimson; bill black; legs bluish-grey. Red morph has chin to breast orange-red. Buff morph is pale cinnamon-buff below, whiter on chin and throat, tinged greenish-grey on flanks and undertail-coverts. Black-and-green morph (restricted to Usambara Mts, in Tanzania) has chin to breast black, continuous with black of face mask, and merging into green on rest of underparts. Female is like male, but face mask duller, greyer behind eye, eyes paler crimson, and underparts duller; yellow morph with underparts greenish; red morph with red below less extensive and less intense than on male; buff morph with underparts duller and browner than male. Juvenile has upperparts and tail like adult's, but tips of secondaries, tertials, alula and upperwing-coverts with narrow whitish fringes; yellow morph yellow below, with close greenish barring on breast, flanks and undertail-coverts, buff morph greyish-white below with dark grey barring, tinged greenish on flanks; juvenile plumage seems to be replaced directly by adult plumage, with no intermediate immature stage. Race *manningi* is smaller and more lightweight than nominate, two morphs, male scarlet morph has chin to upper breast brilliant scarlet, red morph generally duller red than equivalent morph of nominate and yellow tail tips larger, some males very like red-morph nominate female, some females like copper-tinged yellow-morph male of Songea population of nominate; *sandgroundi* also is smaller and lighter than nominate, two morphs, red morph like equivalent morph of nominate but duller, more orange-brown below, black-and-green morph (restricted to Mt Namuli, in Mozambique) like that of nominate. Voice. Varied. Main song of male a low-pitched, hollow series of "hou" or "hoi" or "quoh" whistles, repeated up to 20 times in 4 seconds; also short, rapid trisyllabic "hohoho", like that of Hoopoe (*Upupa epops*), repeated three times in 8 seconds; and commonly a melodious, soft, liquid "woo-hah" (the "hah" grating, downslurred or upslurred), in S of range repeated 8–12 times at intervals of 3–5 seconds; male may sing alone, or accompanied by female with dry, rasping snarl that increases in volume, "kzeeerrr, screeee, shnyaaaaa", or clicking notes, and single "hoh" followed by long "tick-zzzhaaaa"; also male's high-pitched disyllabic "wop, wop" answered by female's nasal "gaaanh"; male may give both parts of duet, "who-nyaaanh". Other calls a single long snore, both grating and ringing; loud click like sound made by shutting of well-oiled lock, sometimes followed by scolding "klitik-waaa"; high-pitched "zreee" and deeper "gruk-gruk"; in alarm a raucous "rraa-kaaa-kaaa" and bill-snapping followed by growl. When excited, makes wing-fripping sounds in flight.

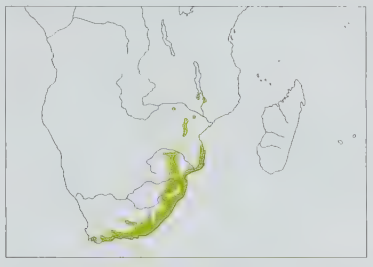
Habitat. Inhabits canopy of montane forest above 2300 m and, at lower elevations, escarpment, lowland and riverine evergreen forests; *Cryptosepalum* forest in Zambia, also thickets bordering marshes. In W of range (race *manningi*) also on dry wooded plateaux, in brachystegia (*Brachystegia*) woods, and in thickets near termite (Isoptera) mounds.
Food and Feeding. Insects, including beetles (Coleoptera), wasps (Hymenoptera), grasshoppers (Orthoptera) and caterpillars. Forages in middle and upper levels of tall forest, keeping to thick tangles of creepers and mossy branches with epiphytes. Searches small branches, twigs, dense foliage, matted creepers, mossy limbs and trunks; works its way up tree and then glides down into next tree. Sometimes hawks insects in air. Solitary and in pairs; often joins mixed-species foraging flocks. Appears to respond to some calls of *C. olivaceus* and to be aggressive towards it.
Breeding. Season Feb in Tanzania, Jul–Aug and Oct in SE DRCongo (Katanga), Oct–Mar in Zambia, Oct–Nov in Malawi, Oct–Jan in Mozambique, and Nov–Feb in Zimbabwe. Territory maintained all year, defended by pair by calling, when bird adopts inclined-upright posture and bows slightly with each call, two males often counter-sing (using same call), probably at territorial boundary; territory size 3–10 ha. Courtship barely known; seems to involve male and female in bowing, swaying, calling, wing-flicking and tail-flicking, and short-flight wing-fripping. Nest, built probably by both sexes, a flimsy shallow saucer or flat platform made from dry twigs and tendrils, lined with *Usnea* lichen, well concealed in creepers or dense foliage 20–30 m above ground in forest tree. Clutch 2 eggs; young thought to be tended by both parents. No other information.
Movements. Resident and partial vertical migrant. In Tanzania, mainly at 1200–2200 m but in Jun–Jul sometimes down to 300–400 m in Uluguru Mts, and seasonally down to 300 m in E Usambaras; possibly an altitudinal migrant also in Zimbabwe and seasonal non-breeding visitor in NE South Africa (Kruger National Park). In Malawi, regular dispersal of 60–100 km possible.
Status and Conservation. Not globally threatened. Range somewhat fragmented, and several montane populations small and isolated. Widespread but local, and uncommon to frequent. In Kenya, occurs on Mt Elgon, Saiwa National Park, Cheranganis, Elgeyu-Maraquet, Tugen Hills, Kericho, Mau, Trans-Mara, Lolgorien, Meru, Embu and Aberdares, but apparently no longer found in Nairobi nor in Taita Hills. In NE Tanzania recorded from Marang Forest (L Manyara) to Arusha National Park and Kilimanjaro, Pare Mts and Usambaras, mainly at 900–2200 m, also S to Ulugurus, Ufipa Plateau, Mbeya, Tatanda, Njombe, Matengo Highlands and Rondo Plateau; very common in forests in E Usambaras. In SE DRCongo (Katanga) apparently uncommon and local; in Zambia frequent and widespread in N, common in *Cryptosepalum* forest, in Northern and Luapula Provinces E to Nyika, and in Western and North Western Provinces. In Malawi, occurs in N in Misuku Hills and on Nyika Plateau, and in SE (E of Rift Valley) in Mangochi, Blantyre, Chiradzulu, Mulanje and Thyolo Districts; on Nyika Plateau, occupies all forest patches of 7·5 ha or more at 2000 m, pairs occupied six out of ten forests of 6·5–8·5 ha at 2200 m, and above 2200 m one pair in 10-ha patch, one pair in 10·5-ha patch and two pairs in 12-ha patch. In Mozambique, found on Mt Namuli and locally in Chimanimani Mts along Zimbabwe frontier and on Mt Gorongoza. In Zimbabwe, present on E slopes of Inyanga Highlands (to 2000 m), Pungwe Falls, the Vumba, Chimanimani Mts (at c. 1800 m), Honde Valley (at 750 m), Lusitu–Haroni confluence, and on Mt Selinda (Chirinda Forest); believed to be locally threatened by continuing destruction of lowland forest. In N South Africa, occurs in escarpment region from Soutpansberg (Hangklip to Entabeni) S to Woodbush, Duiwelskloof, Serala and Mariepskop; accorded conservation status of "Indeterminate" in South Africa. Comparative prevalences of morphs vary regionally: in DRCongo (Upemba), scarlet morph 39% and red morph 61%; in Malawi and South Africa, only red except for a few buff-morph birds on Nyika Plateau (Malawi); in Kenya (Mt Kenya) and Tanzania (Kilimanjaro), red 43%, yellow 53% and buff 4%; in E Kenya Highlands (other than Mt Kenya and Taita Hills) yellow 100%, in W Kenya Highlands red 19% and yellow 81%, in SE Kenya (Taita Hills) and E Tanzania (Pare and Usambara Mts) yellow 53%, buff 43% and black-and-green 4%; in E Tanzania (Ulugurus) yellow 72% and buff 28%, and in S Tanzania (including Songea) yellow 47% and buff 53%.
Bibliography. Benson & Benson (1947, 1977), Benson & Irwin (1965), Benson *et al.* (1971), Borghesio *et al.* (2008), Bowen (1931a), Brooke (1984), Brown & Britton (1980), Chapin (1947, 1954), Clancey (1971a, 1975), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire (1983a, 1989), Fishpool & Evans (2001), Fry *et al.* (2000), Fuchs *et al.* (2005), Ginn *et al.* (1989), Grant & Mackworth-Praed (1942), Hall (1960b), Hall & Moreau (1970), Hall *et al.* (1966), Harris & Arnott (1988), Harrison *et al.* (1997), Harwin *et al.* (1994), Heinrich (1958), Irwin (1981), Lewis & Pomeroy (1989), Lippens & Wille (1976), Lynes (1934), Mackworth-Praed & Grant (1963, 1973), Maclean (1993), Moreau & Southern (1958), Nguembock *et al.* (2008), Priest (1948), Ryan *et al.* (1999), Sclater & Moreau (1933), Serle (1955), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Sonnenschein & Reyer (1984), Stevenson & Fanshawe (2002), Stuart & Jensen (1985), Tarboton (2001), Tarboton *et al.* (1987), Verheyen (1953), Vincent, A.W. (1949), Vincent, J. (1935), White (1962), Wickler & Sonnenschein (1989), Zimmer (1939), Zimmerman *et al.* (1996).

41. **Olive Bush-shrike**

Chlorophoneus olivaceus

French: Gonolek olive **German**: Olivwürger **Spanish**: Bubú Oliváceo
Other common names: Rufous-breasted Bush-shrike

Taxonomy. *Lanius olivaceus* Shaw, 1809, Algoa Bay, South Africa.
Genus sometimes subsumed in *Malaconotus* or in *Telophorus*. Closely related to the superspecies formed by *C. multicolor* and *C. nigrifrons*, but not a member of it since parapatric with latter from S Malawi to N South Africa. May be closely allied with *C. bocagei*. Nominate race occurs in two colour morphs, which may possibly be two formerly allopatric races beginning to intergrade; further study required. Proposed race *taylori* (described from E Mpumalanga, in NE South Africa) is synonymized with nominate. Five subspecies currently recognized.
Subspecies and Distribution.
C. o. bertrandi (Shelley, 1894) – S Malawi E of Shire Valley.
C. o. makawa Benson, 1945 – S Malawi (W of Shire Valley), E Zimbabwe, and extreme N South Africa (N Limpopo Province).
C. o. interfluvius (Clancey, 1969) – W Mozambique.
C. o. vitorum (Clancey, 1967) – SE Mozambique coast S from R Save.
C. o. olivaceus (Shaw, 1809) – E & S South Africa (from NE Limpopo S to S Western Cape), Swaziland and extreme S Mozambique.
Descriptive notes. 18–23 cm; male 31–39 g, female 24·5–43·5 g. Male nominate race buff morph has lores white, narrow whitish postocular superciliary stripe, broad black patch across ear-coverts extending to side of neck and narrowly around upper front of eye; forehead to upper mantle bluish-grey, rest of upperparts olive-green; central three pairs of tail feathers blackish with olive-green outer edges, next pair blackish with distal part of outer web dark green and tip yellow (c. 7 mm long), outer two pairs with outer web green, inner web black at base and yellow at tip; upperwing dark green, most larger feathers broadly fringed olive-green; cheek and chin to breast light creamy buff, breast more cinnamon-buff, belly white, undertail-coverts greyish-white, flanks pale grey or olive (sometimes with about five faint dark bars), thighs olive; underwing-coverts and axillaries



pale yellow (coverts along leading edge of wing grey), large yellow area on underside of flight-feathers formed by broad borders of inner webs; iris dark brown to chestnut-red or purple-brown; bill black, sometimes greyish base of lower mandible; legs bluish-grey. Olive morph differs in having whole of upperside, including crown, bright olive-green, lores and supercilium greenish-yellow, cheek and chin to breast light orange, belly and undertail-coverts greenish-yellow, and flanks bright green. Female of buff morph is like buff-morph male, but ear-coverts to side of neck grey (like crown), often darker grey on ear-coverts, supercilium vestigial or absent, breast duller, slightly more barring on flanks, all tail feathers green, outer two pairs with narrow yellow fringe on tip and inner web; female olive morph is like male of corresponding morph, but ear-coverts grey, supercilium inconspicuous, flanks with more extensive dark green barring, tail feathers as for buff-morph. Juvenile buff morph is dull olive-green above, greyer on head, whitish below, chin to upper breast barred dusky, lower breast and flanks barred dark green, tail as female, wing as adult but tips of secondaries, tertials and upperwing-coverts fringed buffish-white; olive-morph juvenile similar, but brighter olive-green above, greenish-yellow with dark green barring below, primary coverts barred, bill horn-brown. Races differ mainly in details of coloration and in bill size, all except nominate being monomorphic (buff): *makawa* resembles buff-morph nominate, but brighter green above, bill larger; *bertrandi* is like previous, but male has indistinct supercilium, and has greener tail with blackish confined to basal part of inner feathers and yellow to narrow fringes on outer two feather pairs; *interfluvius* is like nominate, but breast paler and less yellow-tinged, flanks pale olivaceous grey and faintly barred, and bill less heavy than in preceding two races; *vitorum* resembles last, but white supercilium more prominent, and facial mask dark grey (rather than black). Voice. Vocal; calls all year, mainly in austral spring. Male song varied, 5–10 ringing whistles, first two usually short and higher-pitched; can be slow and measured "hi-hhh-hay-kway-kway-kway-kway-kway-kway" or faster "pikwik-koi-koi-koi-koi-koi-koi" or almost trilled "wikokokokokoko"; either ascending "ki-ki-ki-ki-heeee" (very like song of *C. sulfureopectus*) or descending, slowing "hi-hi-tew-tew-tiew-tiew-teyouw"; males often counter-sing with each other, using same calls. Female occasionally joins in with a few tearing scolds, "zzrrreee-zzrrreee".
Habitat. Coastal, lowland and montane evergreen forests up to mistforest; matted evergreen dune forest, thickly wooded valleys and riverbanks, dense patches of thornveld, *Philippia* heath, wattle (*Acacia*) plantations; isolated forest patches at up to 2300 m.
Food and Feeding. Hymenoptera, including bees, hornets and ants; also beetles (Coleoptera), grasshoppers (Orthoptera), mantises (Mantidae), larvae, spiders (Araneae); some fruit, including figs (*Ficus*). Forages mostly in canopy and middle stratum; sometimes descends to low tangles at forest edge. Gleans from leaves and wood, hopping and bounding among twigs and small branches; agile, moving through vegetation rapidly and silently, peering, darting at prey, often making short "fripping" flights, and gliding quite fast between trees. Singly and in pairs, secretive, even when singing, but inquisitive; frequently joins mixed-species flocks. Seems to respond to calls of *C. nigrifrons*.
Breeding. Season Oct–Nov in Malawi, Oct–Jan (mainly Nov) in Zimbabwe and Nov–Dec in Mozambique; in South Africa, Nov–Feb in N (former Transvaal), Sept–Dec in KwaZulu-Natal and Dec–Jan in S; single-brooded. In territorial interactions, male threatens with horizontal stance, bowing, swaying from side to side, flicking tail, and making discordant notes and piping whistles, snapping or clicking bill and making short wing-fripping flights; males often counter-sing with each other, in upright stance, tail slightly fanned. Nest, built by both sexes, a flimsy shallow saucer made from long, wiry twigs, thin pieces of grass, fine *Asparagus* stems, roots, aerial roots and tendrils (tendrils and roots becoming finer towards centre of nest structure), lined fairly thickly with rootlets and other fine material, eggs often visible from below; placed up to 6 m above ground in fork or across main branch, well concealed among foliage, often in acacia, creeper, *Philippia* or *Woodwardia* tree. Clutch 1–2 eggs; incubation by both sexes, period 18 days; chicks fed by both parents, at first by regurgitation, some evidence that only male broods them, nestling period 16–17 days. Sometimes breeds for first time while still in barred juvenile plumage. Adult can survive for more than 7 years.
Movements. Mainly resident; evidence of altitudinal migration in Malawi and E Zimbabwe, where occurs down to 350 m in Lusitu–Haroni confluence in non-breeding season. Some individuals of this species in SW Mozambique possibly non-breeding visitors from adjacent South Africa (escarpment forests in Limpopo Province).
Status and Conservation. Not globally threatened. Patchily distributed in N of range; more continuous in S. In Malawi, found W of Rift Valley from Chongoni and Mt Dedza to boundary between Ntcheu and Mwanza Districts, and E of Rift from Malosa (Zomba) to Mulanje District; recorded at Fort Lister. In Zimbabwe, a single record in N, and in E highlands frequent at 1300–2300 m and uncommon at lower levels. In Mozambique, frequent near Zimbabwe frontier and on Mt Gorongoza at 900–1200 m, also in upper R Búzi drainage and the Vumba; uncommon along Sul do Save littoral and in S. Uncommon to frequent in South Africa and Swaziland; estimated density of 1 pair/1·5 ha in forests of former E Transvaal. Probably threatened locally to some degree by deforestation.
Bibliography. Arnott (1982), Benson (1945), Benson & Benson (1977), Chapin (1947), Clancey (1964a, 1967, 1971a, 1974, 1975, 1980a), Cyrus & Robson (1980), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire (1989), Fishpool & Evans (2001), Frandsen (1982), Friedmann & Loveridge (1937), Fry *et al.* (2000), Ginn *et al.* (1989), Hall & Moreau (1970), Hall *et al.* (1966), Hanmer (2001b), Harris & Arnott (1988), Harris & Franklin (2000), Harrison *et al.* (1997), Hockey *et al.* (1989), Irwin (1981), Mackworth-Praed & Grant (1963), Maclean (1993), Maclean & Vernon (1976), Parker (1999), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Sonnenschein & Reyer (1984), Steyn (1996), Swynnerton (1908), Tarboton (2001), Tarboton *et al.* (1987), Vincent, A.W. (1949), Vincent, J. (1935), White (1962).

42. **Orange-breasted Bush-shrike**

Chlorophoneus sulfureopectus

French: Gonolek soufré **German**: Orangebrustwürger **Spanish**: Bubú Azufrado
Other common names: Sulphur-breasted Bush-shrike

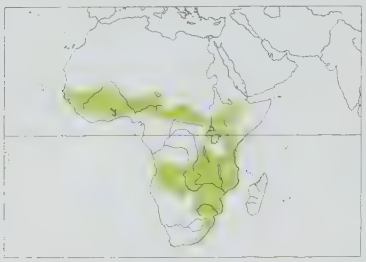
Taxonomy. *Lanius* (*Tchagra*) *sulfureopectus* Lesson, 1831, no locality = Senegal.
Genus sometimes subsumed in *Malaconotus* or in *Telophorus*. Probably closely allied with *C. multicolor*, but also closely resembles the much larger, heavy-billed, savanna-dwelling *Malaconotus blanchoti*. Birds in E coastal lowlands described as additional races *suahelicus* (S Somalia S to C Mozambique) and *terminus* (SE Tanzania S to SE South Africa), but differ only in slightly smaller

size from *similis*; both are synonymized with latter. A specimen from Entebbe (Uganda), named as *C. andaryae*, was probably a hybrid between present species and *C. bocagei*. Two subspecies currently recognized.

Subspecies and Distribution.

C. s. sulfureopectus (Lesson, 1831) – S Senegal and N Sierra Leone E to Central African Republic, W Sudan, N DRCongo and W Uganda.

C. s. similis (A. Smith, 1836) – S Sudan, Ethiopia, S Somalia, SW & E DRCongo, E Uganda and Kenya S to Angola, N Namibia, N & E Botswana, Zimbabwe, Mozambique and E South Africa.



Descriptive notes. 17–19 cm; male 24–34 g, female 24–32 g. Male nominate race has forehead, forecrown and long superciliary stripe bright yellow, lores black, ear-coverts black, grading to dark grey on side of neck; hindcrown to mantle light bluish-grey, rest of upperparts to uppertail-coverts and tail green, all tail feathers except central pair with yellow tips (c. 3 mm wide on T2, increasing to c. 8 mm on T6) and, on outer three pairs, extending as fringe along inner web; flight-feathers dark brown, primaries with green base of outer web and yellow margin near tip, secondaries with green outer webs, tertials green, tips of secondaries and tertials with narrow yellow fringe, alula and upperwing-coverts green, greater coverts tipped yellow; cheek and chin to throat bright yellow, upper breast orange, rest of underparts bright yellow; underwing-coverts and axillaries yellow, underside of flight-feathers extensively yellow (broad yellow borders of inner webs); iris dark brown; bill black; legs dark grey or blue-grey. Female is very like male, but orange on breast less intense. Juvenile has crown to side of neck, mantle and back barred grey and whitish, supercilium pale buff, back and wing feathers tipped whitish or pale yellow with dusky subterminal mark, uppertail-coverts barred with pale yellow, throat and underparts pale yellowish-buff, breast, upper belly, flanks and thighs barred whitish and dark grey, eyes light brown; immature like adult, but forehead olive (not yellow), supercilium whitish, lores and ear-coverts pale grey, upperwing-coverts spotted with yellowish, underparts pale yellow; rump and upper breast with vestigial dusky bars. Race *similis* closely resembles nominate, but has ear-coverts grey, blackish only near eye. Voice. Song of presumed male, from within upper canopy of prominent tree or from near top of thick bush, variable, ventriloquial, of pure ringing whistles, 3 or 4 short notes and one long one, "wi-hi-hi-hi-wheeee", first note sometimes lower ("woo-hi-hi-heeee"), the whole sometimes descending, as "hi-hi-hu-hu-hu-yooo"; a second common song is faster, with 4–9 (up to 15) notes on one pitch, 5 notes per second, "wi-wi-wi-wi-wi-wi-wi", and even faster versions higher-pitched. Some geographical variation: in Senegal typically a 4-note "put-wit-too-weee" and 2-note "hoop, heeee", each repeated in series; in Ivory Coast mainly a 3-note "hooey-hooey-hooey", also repeated in series. Presumed female sometimes responds with quiet, husky "skizzz" or "tzzrrik-tzzrrik". Threat call a harsh, drawn-out "tzzrrrrr" immediately followed by bursts of bill-clicking; in alarm and aggression the "tzzrrrr" longer, higher-pitched, and interrupted by short, jerky flights with wing-fripping; also, a snoring "chizzzzip" scold, and in anxiety or alarm a soft, low "chrrr" and "tu-tu-tu-tu-tu". Begging call of nestlings a high-pitched "seeeep-seeeep" with ventriloquial quality.

Habitat. Wide variety of woody vegetation, mainly rather low and with dense foliage, including acacia (*Acacia*) woods, especially along streams, *Cryptosepalum* forest, brachystegia (*Brachystegia*) woodland, *Erythrina* bushland, scrub, gallery forest and mixed riparian groves, also forest edge, bushveld, clumps of bushes and shrubby pasture, thornveld, coastal savanna bush, thickets growing on termitaria, and woods around foot of inselbergs. Mainly below 1500 m; uncommonly to 3000 m.

Food and Feeding. Small insects, including bees, wasps and other Hymenoptera, caterpillars and other larvae, mantises (Mantidae), beetles (Coleoptera); caterpillars and, after them, Hymenoptera seem to be important foods. Possibly takes chicks of small birds. Forages at various levels, e.g. in canopy of acacia woods and in canopy and middle stratum of *Cryptosepalum* forest. Hops strongly and rapidly among branches and leafy twigs, making short flights within tree, pausing and peering about, and darting quickly at an insect; works its way up tree to top, and then glides down to base of canopy of nearby tree. One individual, when taking honeybees (*Apis*) at a flowering shrub, perched very still and snatched each one as it passed; it flew into adjacent tree, carrying each bee in bill, and beat it against branch. May prey on chicks of Red-billed Quelea (*Quelea quelea*) in colonies. Forages singly and in pairs; often joins mixed-species flocks.

Breeding. Breeds in Mar–Jun in Mali, May–Jul in Ghana and Nigeria, Aug–Sept in Sudan, Apr–May in Ethiopia, Feb–Jun in Uganda, Dec–Jan in Tanzania, mid-Sept to mid-Oct in DRCongo (Lubumbashi); birds with enlarged gonads in Nov and Jan in Angola; season Oct–Feb in Zambia, Aug–Feb in Malawi, Oct–Jan in Botswana, Sept–Apr (mainly Oct–Dec) and some records in Jun and Jul in Zimbabwe; Sept–Mar (mainly Oct–Nov) in N South Africa (former Transvaal); probably generally single-brooded, but some records of second brood. Nest, built by both sexes, a flimsy, openly constructed platform made from grass, petioles and fine dry twigs, sometimes with cobweb, depression in centre lined with fine rootlets and creeper tendrils (eggs visible from below), placed generally more than 4 m and can be up to 10 m above ground in multiple fork in lateral branches of thorn tree or among thick foliage or creeper tangles (although sometimes built before tree in leaf), usually near site of previous season's nest; once a second nest built for rearing of second brood. Clutch 1–3 eggs; incubation by both sexes, period 13–14 days; chicks fed by both parents, nestling period 12–14 days. Adult can survive for at least 6 years.

Movements. Generally resident, but evidence of seasonal movements in Uganda and S Malawi, and a partial migrant in W Africa. Apparent influx on Ghana coast in dry season, Nov–Feb, and in Nigeria records farthest N tend to be in wet season, May–Jul; seasonal changes in abundance at Bamako, in S Mali; around Ouagadougou, in Burkina Faso, appears only between late Mar and mid-Sept; widespread resident in Togo, but may also be partial migrant there.

Status and Conservation. Not globally threatened. Has wide distribution across nearly all sub-Saharan Africa except for Congo Basin, the Horn, and SW Africa. Generally not uncommon in W Africa; locally common in E & S of range. Uncommon in Senegal, and frequent in Gambia (commonest near coast); in Niger occurs only in W National Park, where rare; uncommon to frequent in N & C Nigeria, absent from Liberia, SW Ghana, Gabon and PRCongo; frequent in Cameroon and S Chad; in Central African Republic, uncommon to locally frequent N to Bamingui-Bangoran National Park but uncommon in NE (Vakaga). In Sudan, fairly common in better woodlands in SW & SE, and occurs N to Jebel Marra and En Nahud area; frequent to common in S Ethiopia (mainly below 1800 m), with records N to L Tana; in Somalia restricted to extreme S (Boni Forest), Jubba–Webi Shabeelle triangle, and Shabeelle valley N of Mogadishu. In DRCongo, frequent in Uele, scarce in Kasai, and frequent in Manyema, Katanga and Marungu; common throughout W & S Uganda; present in N Rwanda and S Burundi (Bururi Forest), but status in both (also in adjacent parts of DRCongo) unclear. Widespread in S Kenya, but absent from arid regions in most of N & E (except coast and some localities with dense riverine acacias); common in E in Tanzania but sparse in W (not found recently in C areas). Locally common throughout interior Angola (except in highlands) and along coast from Cabinda and mouth of R Congo S to about Benguela, and frequent in Cunene Valley; present almost throughout Zambia. Uncommon to locally frequent in N & NE Namibia, N & E Botswana, Zimbabwe, Swaziland and E & SE South Africa.

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PLATE 6 ➤



Genus *TELOPHORUS* Swainson, 1832

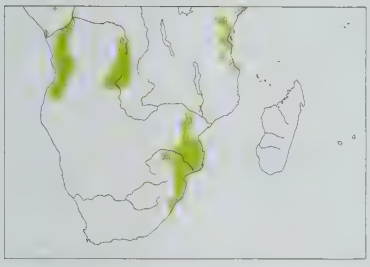
43. Gorgeous Bush-shrike
Telophorus viridis

French: Gonolek vert **German**: Perrinwürger **Spanish**: Bubú Verde
Other common names: Four-coloured Bush-shrike; Perrin's/Perkins's Bush-shrike (*viridis*)

Taxonomy. *Laniarius viridis* Vieillot, 1817, Malimbe (= Malembo), Cabinda, Angola.
Molecular-genetic studies suggest that genus is more closely allied to *Chlorophoneus* and *Laniarius* than to the clade formed by *Malaconotus*, *Dryoscopus* and *Tchagra*, although has been thought to link arboreal *Chlorophoneus* and semi-terrestrial *Tchagra*. Present species forms a superspecies with *T. dohertyi*; the two have conventionally been grouped in *Chlorophoneus*, but studies of nuclear and mitochondrial DNA support their placement in present genus. Green-bellied nominate race in W of range formerly treated as a separate species, distinct from the three yellow-bellied races in E, but all are vocally very similar. Four subspecies recognized.

Subspecies and Distribution.
T. v. viridis (Vieillot, 1817) – SE Gabon, SW PRCongo, W & E Angola (including Cabinda), SW & S DRCongo and NW Zambia.
T. v. nigricauda (S. R. Clarke, 1913) – extreme S Somalia, SE Kenya and E Tanzania.
T. v. quartus (Clancey, 1960) – S Malawi, E Zimbabwe and W & S Mozambique.
T. v. quadricolor (Cassin, 1851) – NE South Africa (N & E Limpopo S to NE Eastern Cape) and Swaziland

Descriptive notes. 18–19 cm; male 30–40·5 g, female 31–39·5 g. Male nominate race has saffron-yellow line across forehead extending back to eye; crown, hindneck and upperparts, including upperwing, dark olive-green, tail blackish; cheek to chin and throat scarlet, enclosed by black band through lores, below eye and narrowly along side of throat, joining broad black gorget across



upper breast, gorget bordered below by transverse band of red; belly and flanks bright green, with scarlet-maroon lower edge of red subgorget band and irregular scarlet-maroon stripe, often broad, down mid-line to undertail-coverts, which are brownish-maroon; underwing-coverts and axillaries green; iris dark brown; bill black; legs bluish-grey or slaty brown. Female is duller than male, differs in having lores dusky, little black around side of throat, tail tinged green at base, narrower black gorget (often broken), chin and throat more orange than scarlet (often mottled yellow, sometimes all yellow), middle of belly brown, undertail-coverts orange-brown. Immature is duller green above, most wing feathers having blackish subterminal line, no black or red in plumage, has ill-defined yellowish stripe from bill to eye, yellowish chin and upper throat, yellowish-green breast finely barred, rest of underparts greenish-yellow, greener on flanks, yellower on undertail-coverts. Races differ mainly in coloration: *quadricolor* is slightly less dark above than nominate, central tail feathers green and grading to blackish distally, broad supercilium yellow, gold or orange and longer (extending a little behind eye), chin and upper throat sometimes more orange-red (less scarlet), red below gorget less deeply toned and often paler (more of a reddish wash), lower breast and belly greenish-yellow (no reddish mid-line), undertail-coverts orange-red; *quartus* is similar to previous, but brighter above, yellow in underparts tinged brownish; *nigricauda* also is similar, but central tail feathers blacker, greater area of red in centre of breast below gorget. Voice. Male song loud, far-carrying liquid whistles, 1–3 short "ko", "kok" or "kong" notes followed immediately by 1 or 2 upslurred "kowick" or "kowee" notes; also a slow "ko-ko-whoeee", a more emphatic "ko-koweet-koweet", a less emphatic "ko-koway-koway" and a rapid "kokoweekowee"; song lasts c. 1 second and repeated after 2–5 seconds, may sing c. 20 times per minute for several minutes on end; song often preceded by soft "ti" or "klink" note (audible only at very close range). Female of race *quadricolor* (but apparently not of nominate) sometimes duets with single or double harsh "zzrrrer-zzrrrer" notes. Contact call a low, guttural "grr-grr-grr"; alarm a louder frog-like or corvid-like rasp; when excited, makes fripping noises with wings.

Habitat. Undergrowth in patches of montane high forest, to 2000 m. In Angola coffee forest and dry forest; in Zambia only *Cryptosepalum* forest; in Kenya found in *Afzelia*, brachystegia (*Brachystegia*) and *Cynometra* in gallery forest, woodland and thickets. In S Africa occurs in semi-evergreen thickets at edges of lowland and middle-altitude forests, riparian forest, *Ficus sycamorus* on R Limpopo, tangles of forest creepers, secondary forest with thorny lianas and brambles on drainage lines and hillsides, dune forest and thick undergrowth.

Food and Feeding. Small arthropods, including hawkmoths (Sphingidae) and other moths (Lepidoptera), caterpillars, beetles (Coleoptera), parasitic wasps (Apocrita), and spiders (Araneae). Forages in low forest undergrowth, tangles, shrubs and rank grass; tends to work its way upwards in trees, gleaning trunks, branches and foliage; hops on ground, turning over leaf litter. Agile, moving silently and quickly in crouched, horizontal posture; peers about and darts at prey. Sometimes hawks insects in air. Usually in pairs; sometimes singly.

Breeding. Season Mar–May in Angola, Apr in Malawi, Oct–Feb in Zimbabwe, Nov–Feb in Mozambique, and Oct–Dec in South Africa. Male advertises territory, of less than 2 ha, by singing from canopy, in upright posture with head held up, scarlet throat feathers expanded to show yellow bases; one individual occupied same territory for 6·5 years; males often counter-sing in unison or antiphonally, perching sometimes less than 1 m apart; singer bows excitedly, jerks body from side to side and flicks wings and tail, and threatens with rapid bill-snapping. In courtship, male bows, sings and bill-snaps in front of female. Nest a rather thin platform or saucer of twigs, roots, stalks and grasses, lined with dry leaf petioles and tendrils (eggs visible from beneath nest), hidden 60–160 cm above ground on woody fork or among twigs or creepers. Clutch 2–3 eggs; incubation mainly by female, sometimes assisted by male; chicks brooded by female, fed by both parents; no information on duration of incubation and nestling periods; fledglings remain with parents for at least four months.

Movements. Mainly resident; race *quadricolor* moves locally from drier parts of range for non-breeding season.

Status and Conservation. Not globally threatened. Three main populations. Nominate race uncommon to locally common, probably widely under-reported, being secretive in dense thickets, and likely to thrive in those parts of S DRCongo and C & NE Angola where presently unknown. In Gabon recorded only at Leconi, and in PRCongo only at Pointe-Indienne, Diosso and Diosso–Mpinde road; locally common in Angola in Cabinda, Uíge, Malanje and Cuanza Norte S to Huíla; in DRCongo, occurs in W (E to Kwamouth) and recorded in SE in Kasai and Katanga (where doubtless under-reported), also once at Baraka, on L Tanganyika, but absent from Itombwe. Race *nigricauda* local and uncommon, mainly below 600 m in extreme S Somalia and in coastal Kenya S from Boni Forest and Lamu, inland on lower R Tana, Mt Endau (at 1200 m), Mt Kasigau and Shimba Hills National Park; Kenyan range apparently contracting, as no recent records from former sites in Chyulu, Taita, Sagala Hills and on R Voi, in Tsavo East National Park; in coastal Tanzania S to Mikindani and inland to N Pare Mts (at 1100–2000 m), foothills of Uluguru Mts, Liwale and Rondo Plateau (no recent records from E Usambara foothills). Races *quartus* uncommon in undeveloped parts of lower Shire valley (S from Lengwe), in Malawi, where rediscovered at Lengwe in 2002 after 18-year lack of records, and 20–30 pairs occupying 9–10 km² of suitable habitat; local and uncommon in E highlands of Zimbabwe (to 1500 m), and apparently frequent in W Mozambique, and widespread and not uncommon S of R Save (especially near coast); *quadricolor* locally common in NE South Africa in Soutpansberg–Blouberg foothills and N lowveld, and locally common in E KwaZulu-Natal from coast up to 600 m; some evidence that this species was once more widespread in E South Africa, but also may have benefited from bush encroachment resulting from overgrazing there and in Swaziland.

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44. Doherty's Bush-shrike

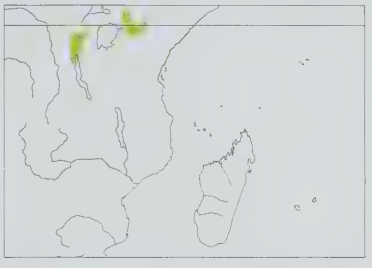
Telophorus dohertyi

French: Gonolek de Doherty **German**: Rotstirnwürger **Spanish**: Bubú de Doherty

Taxonomy. *Laniarius dohertyi* Rothschild, 1901, Kikuyu Escarpment, Kenya.

Molecular-genetic studies suggest that genus is more closely allied to *Chlorophoneus* and *Laniarius* than to the clade formed by *Malaconotus*, *Dryoscopus* and *Tchagra*, although has been thought to link arboreal *Chlorophoneus* and semi-terrestrial *Tchagra*. Present species forms a superspecies with *T. viridis*; the two have conventionally been grouped in *Chlorophoneus*, but studies of nuclear and mitochondrial DNA support their placement in present genus. Monotypic.

Distribution. E DRCongo, SW Uganda, W Rwanda, W Burundi and W Kenya.



Descriptive notes. 19 cm; 36–40 g. A relatively small-billed bush-shrike. Male of crimson morph has forehead and forecrown, lower cheek, chin and throat bright crimson, sharply demarcated from black lores, band under eye, down side of neck and as a broad gorget across breast; hindcrown to uppertail-coverts and upperwing olive-green, tail black; below black gorget, centre of breast and belly bright yellow, side of breast, flanks and thighs yellowish-green, undertail-coverts crimson; underwing-coverts and axillaries olive-green; iris dark brown; bill black; legs grey or bluish-grey. Yellow morph (rare) has crimson areas of plumage replaced by bright yellow. Female (crimson morph) differs from male in having faint, narrow olive-green outer edges of tail feathers. Juvenile is tawny olive-green above, with fine blackish barring from hindcrown to uppertail-coverts, wings brownish-green, upperwing-coverts and tertials tipped buff and with blackish subterminal line, tail greenish-grey, chin to belly yellowish-green, pale on throat, brighter on belly, with breast and flanks finely barred, undertail-coverts pinkish-red. Voice. Song, presumably of male, variable, of loud piercing fluty whistles or liquid notes in brief phrases, "wok-wok-week-week", upslurred "koo-wee, koo-wee, koo-wee", liquid "koi-kwer" or "koi-kwodi", "chop-o-chop-o-chop", "quit-quit-quit-work" or slow trilled "kikoikoikoikoikoi"; repeats one phrase several times and then switches to different one; song resembles that of *T. viridis*, but lacks latter's repeated low-pitched notes. Also, a sharp "quip" and, in alarm, "tchrak, tchrak" and low rasps. No information on voice of female.

Habitat. Low, dense, moist thickets and tangles of scrub and bracken in clearings and at edges of montane and submontane forest (both primary and secondary forest); also thick bushes among bamboo. At 1500–2700 m in DRCongo; 1360–2100 m in Uganda; 1600–3350 m in Kenya.

Food and Feeding. Beetles (Coleoptera) and other arthropods. Forages on ground among shrubbery, probably also in shrub foliage. Generally in pairs.

Breeding. Various indications of breeding in May–Jul in DRCongo, Aug in Rwanda, Dec in Uganda and May–Jun in Kenya. No further information.

Movements. Resident.

Status and Conservation. Not globally threatened. Readily overlooked, but reportedly fairly common in Kivu (DRCongo). Although absent from Lendu Plateau and Ruwenzori Mts, fairly common in extreme SW Uganda (1360 m to at least 2100 m); common in W Rwanda. Locally common in highlands of W & C Kenya on Mt Elgon, Cherangani Hills, Mau, Nyandarua (Aberdare) Mts and Mt Kenya; old records from Sotik, Kericho, Limuru and Kiambu. Uncommon, or perhaps overlooked, in other parts of range.

Bibliography. Bennun & Njoroge (1999), Britton (1980), Brown & Britton (1980), Carswell *et al.* (2005), Chapin (1954), Cheke (1978), Dowsett (1990), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Dowsett-Lemaire (1990), Fishpool & Evans (2001), Fry *et al.* (2000), Fuchs *et al.* (2005), Gaugris (1976), Gronvik (1934), Hall & Moreau (1970), Harris & Franklin (2000), Lewis & Pomeroy (1989), Lippens & Wille (1976), Mackworth-Praed & Grant (1960, 1973), Nguembock *et al.* (2008), Prigogine (1971), Schouteden (1938, 1960, 1966, 1969), Sessions (1966), Short *et al.* (1990), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Stevenson & Fanshawe (2002), White (1962), Zimmerman *et al.* (1996).

45. Bokmakierie

Telophorus zeylonus

French: Gonolek bacbakiri **German**: Bokmakiriwürger **Spanish**: Bubú Silbón
Other common names: Bokmakierie Shrike/Bush-shrike

Taxonomy. *Turdus zeylonus* Linnaeus, 1766, Cape of Good Hope, South Africa.

Molecular-genetic studies suggest that genus is more closely allied to *Chlorophoneus* and *Laniarius* than to the clade formed by *Malaconotus*, *Dryoscopus* and *Tchagra*, although has been thought to link arboreal *Chlorophoneus* and semi-terrestrial *Tchagra*. Present species sometimes placed in *Chlorophoneus*, but differs in lack of mouth spots and in nest structure, egg coloration, semi-terrestrial habit and communication behaviour. Thought to be most closely related to *T. cruentus*, which it resembles in plumage pattern, tail shape and pattern, behaviour and voice. Four subspecies recognized.

Subspecies and Distribution.

T. z. phanus (E. J. O. Hartert, 1920) – SW Angola (arid coastal plain) and NW Namibia (Kaokoveld).

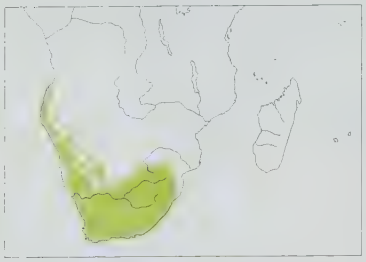
T. z. thermophilus Clancey, 1960 – Namibia (S from c. 21° S), SW & SE Botswana and W & N South Africa (E to Limpopo and W Free State).

T. z. zeylonus (Linnaeus, 1766) – E & S South Africa (C & E Free State and KwaZulu-Natal S to SE Western Cape), Swaziland and Lesotho.

T. z. restrictus Irwin, 1968 – Chimanimani Mts, on Zimbabwe–Mozambique border.

Descriptive notes. 22–24 cm; male 57–71 g, female 48–76 g. Nominate race has grey forehead to hindneck, well-demarcated bright yellow superciliary stripe from bill to above or just behind eye,

On following pages: 46. Rosy-patched Shrike (*Telophorus cruentus*); 47. Brubru (*Nilaus afer*); 48. White-tailed Shrike (*Lanioturdus torquatus*).



bright olive-green upperparts, including upperwing; central pair of tail feathers dark olive-green, remainder black with bright yellow tips, yellow area progressively larger from rectrix T2 to T6; lores black, chin and throat bright yellow, bordered by black band 3–5 mm wide at side of throat and 12–17 mm wide in mid-line; lower breast and belly yellow to rich olive-yellow becoming olive-green or grey on sides of breast and, broadly, on flanks, thighs olive-green sometimes with variable amounts of grey or yellow, undertail-coverts yellow; underwing-coverts greyish-yellow; iris mauve-brown; bill black; legs blue-grey. Sexes alike, female's gorget perhaps on average narrower than male's. Immature has forehead to hindneck dark greyish olive-green, upperparts like adult but dark area of tail feathers brownish-slate (not black), lores and ear-coverts dark grey, chin and throat pale grey, merging into yellowish-olive on breast and greyish-olive on rest of underparts, breast and flanks finely and inconspicuously barred or vermiculated with blackish, eyes greyish-brown, bill horn-coloured with paler base; juvenile at fledging like immature, but with large patch of bare grey skin around eye, visible skin between other feather tracts pale yellow and bright pink, gape yellowish-white, mouth bright yellow, yellow throat patch begins to show at 70 days of age. Race *thermophilus* is paler than nominate, particularly on crown and nape, mantle greyer, no greenish tinge on side of breast and flanks; *phanus* is like previous but paler still, flanks chalky white, bill slightly heavier; *restrictus* is darker than nominate, particularly on crown and nape, and with heavy grey wash on flanks, also somewhat shorter-winged and longer-tailed. Voice. Song loud, liquid, far-carrying, generally by two paired individuals in antiphonal duet; twelve or more different songs identified; male and female seem to have different repertoires but share some notes, and may utter sounds simultaneously or in rapid succession antiphonally. Male sings loud ringing whistles, varying from slow "houuuu" or double "hu-hu" or "hwe-hwe" to a rapidly delivered phrase including both slow "huu-huhuhu" and rapid, higher-pitched "hehehe"; female responds with lengthy, rapidly repeated whistles, which include "wikwikwikwikwikwik..." and high-pitched "hwehwehwehwehwe" or "teuteuteuteu...". Duetting initated usually by male, sometimes by female, and mate responds whether nearby or distant; if mate has disappeared, partner can sing complete duet sequence by itself. Songs have marked individual and regional variation, and different pairs can be identified by their duets; species' vernacular name is onomatopoeic, from duet of "bok-bok..." or "wok-wok..." followed by trilling "trrrreee". Immature starts to sing, imperfectly, at 55–70 days, joining parents to make trio songs. Other sounds are variety of stuttering, croaking, tearing and slashing notes, bill-clicking and wing-fripping; in territorial threat, pair duets with rising trills "trrrrrrrrree...", tearing "tzzrrreeo...", buzzing noises and sharp bill-clicking; when one individual changes notes, mate also does so; frips wings when excited; alarm at predator on ground slow "tok" notes, at aerial predator harsh scolding and "krrr..." sounds.

Habitat. Bushes and thickets with plenty of quite open ground around. Thickets in open grassland, bushy and rocky hillsides, scrub in hillside ravines, broken thornveld on stony ground with aloes (*Aloe*) and euphorbias (*Euphorbia*), also plantations, farmyards, gardens, tamarisk (*Tamarix*) growth along dry watercourses, dense protea (*Protea*) scrub, coastal fynbos and red dunes. In Mozambique, steep boulder screes with *Philippia* heath or *Hymenodyction* scrub and borders of forested ravines where rugged quartzite and schist massifs fold; in Namibia, occurs on arid boulder-strewn mountainsides with scattered bushes, and dunes with sparse scrub. To 2550 m.

Food and Feeding. Mainly invertebrates, including longhorn and shorthorn grasshoppers (Orthoptera), stick-insects (Phasmida), heteropteran bugs, mantises (Mantidae), moths and both hairless and hairy caterpillars (Lepidoptera), adult and larval beetles (of families Tenebrionidae, Scarabaeidae, Curculionidae, Lampyridae), flies (Diptera), termites (Isoptera), spiders (Araneae), sun-spiders (Solifugida), centipedes (Chilopoda); less commonly geckos (Gekkonidae), young chameleons (Chamaeleonidae), small snakes, and frogs; rarely, takes small birds up to size of prinias (*Prinia*) and white-eyes (Zosteropidae); occasionally a few seeds and small fruits. Hunts in grass tufts and in clumps of bushes and small trees, moving on ground, searching bases of vegetation, sometimes jumping up to seize prey; hops about in shrub, searching stems and leaves, gradually working its way upwards, and then flies down to base of another clump nearby. Most prey caught on ground, the bird often chasing it by hopping and running in zigzags with long, swift strides, with head drawn in and tail depressed; may fly up from bush to seize insect in flight. Large prey generally beaten and chewed on ground, then carried in bill to concealed perch in foliage; caterpillar usually wiped on ground or wedged in grass fork and scraped with the bill before before being consumed. When flushed from ground, flight rather laboured, close to ground, with fast shallow wingbeats and tail generally fanned; dives straight into cover. Usually in pairs.

Breeding. Season lengthy in South Africa, mainly Aug–Nov (but clutches in all months except Apr) in Limpopo, Sept–Mar in KwaZulu-Natal, Jul–Mar in Eastern Cape and Jul–Oct in Western Cape; female with oviduct egg in Apr in Namibia, and birds in breeding condition Aug–Sept in Zimbabwe. Territory or home range c. 5 ha in suburban habitats, larger in open bushy country and arid areas (after young have left, adults move into larger territory which may be extension of breeding one), defended vigorously by pair and advertised throughout year, bird perching on top of low eminence, body inclined, neck stretched, bill open and pointing upwards so that yellow throat displayed, and sings solo or duets; in territorial threat, tenses body and bows jerkily, flicks wings and fans tail, while making bill-clicking, croaking and ripping sounds; in one encounter, adult pursued another at distance of 1–1·5 m, each often turned to face opponent and displayed by raising and spreading ■ wing (usually the right one) and pointing bill skywards (revealing yellow throat and gorget), then bowing forwards with tail cocked and spread (showing black-and-yellow pattern), pursuer uttered low "kok-kok, wit", and the two fought briefly until, after 20 m of quite slow pursuit, the intruder crossed back into its own territory. Courtship not known to differ from territorial threat display. Nest built by both sexes, sometimes constructing several before settling on one, a shallow bowl, quite neat and compact, made from dry grass, wet stems (e.g. of *Helichrysum*), herbs, fine twigs, roots and rootlets, sometimes with woolly plant down, leaves and man-made materials, sometimes decorated externally with asparagus fern (*Asparagus*), lined with fine grass and rootlets; placed on ground or, on average, 60 cm above it on fork of branch in dense foliage in bush, hedge or tree. Clutch 2–6 eggs, usually 3; incubation by both sexes, usually only female at night, period 14–19 days, usually 16 days; chicks brooded and fed by both parents, which carry more than one food item in bill at a time, parents take shifts in feeding and guarding, both remove faecal sacs (dropping them good distance away), nestling period 14–21 days, average 18 days. Nest occasionally parasitized by Jacobin Cuckoo (*Clamator jacobinus*).

Movements. Resident. Longest distance covered by ringed individual 5 km.

Status and Conservation. Not globally threatened. Locally common within its large range. Not uncommon in Angola from Lobito Bay S to R Cunene; occasional in Iona National Park. Widespread in W & S Namibia; in Botswana, uncommon in SW (from Nossob Camp to Bokspits and Khuis) and sparse in extreme SE. Isolated population in Chimanimani Mts, on Zimbabwe–Mozambique border, estimated in 1981 at 400 birds, mainly in Mozambique (at 1350–2100 m), with only a few pairs in Zimbabwe. Common and widespread in South Africa and Swaziland; in N South Africa restricted to highveld and escarpment region (N to about Ohrigstad) and bushveld (N to about Rust der Winter). Common throughout Lesotho at 1970–2550 m, where population estimated at 10,000–100,000 individuals.

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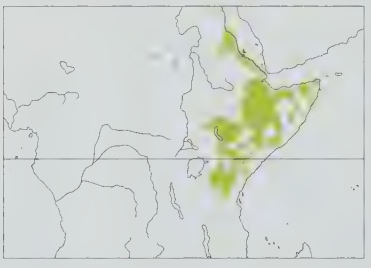
46. **Rosy-patched Shrike**

Telophorus cruentus

French: Gonolek à croupion rose **German**: Rosenwürger **Spanish**: Bubú Pechirrosado
Other common names: Rosy-patched Bush-shrike; Tsavo Bush-shrike (*cathemagmenus*)

Taxonomy. *Lanius cruentus* Hemprich and Ehrenberg, 1828, Arkiko, near Massawa, Eritrea.
Molecular-genetic studies suggest that genus is more closely allied to *Chlorophoneus* and *Laniarius* than to the clade formed by *Malaconotus*, *Dryoscopus* and *Tchagra*, although has been thought to link arboreal *Chlorophoneus* and semi-terrestrial *Tchagra*. Present species was previously placed in latter genus by several authorities or in its own genus *Rhodophoneus* by several others. Thought to be most closely related to *T. zeylonus*, which it resembles in plumage pattern, tail shape and pattern, behaviour and voice. Four subspecies recognized.

Subspecies and Distribution.
T. c. kordofanicus (W. L. Sclater & Mackworth-Praed, 1918) – W Kordofan, in WC Sudan.
T. c. cruentus (Hemprich & Ehrenberg, 1828) – NE Sudan, Eritrea and extreme N Ethiopia.
T. c. hilgerti (Neumann, 1903) – extreme SE Sudan, C, E & S Ethiopia, Djibouti, Somalia and N & E Kenya.
T. c. cathemagmenus (Reichenow, 1887) – S Kenya and NE Tanzania.



Descriptive notes. 22–23·5 cm; male 40–62 g, one female 50 g (*hilgerti*). Distinctive, with long, graduated tail, quite heavy and strong bill hooked and notched. Male nominate race has forehead and crown light grey-brown, tinged pink, lores and narrow short superciliary stripe creamy white, nape to mantle and scapulars pale grey-brown, long fluffy back feathers pink-carmine, rump, uppertail-coverts and central tail feathers like mantle; central pair of tail feathers pale grey-brown with c. 18 structural bars, remaining feathers brownish-black, outer four pairs with white ends (c. 13 mm long on T3, 23 mm on T4, 31 mm on T5, 28 mm on T6), white areas often stained buff or pale rufous by soil in habitat; upperwing light brown, feathers narrowly edged pale buff, leading edge from carpal to below alula conspicuously pale buff; ear-coverts light pink-tinged grey, grading to whitish towards cheek and throat; chin whitish, large patch of pink-carmine in centre of throat and upper breast surrounded by creamy white or very pale buff, the patch separated from (or just confluent with) oblong or irregularly diamond-shaped patch of same colour on lower breast; large grey-brown patch at side of breast extending to side of neck; belly silky white in mid-line, buff at side, flanks and thighs buff, vent buffy, undertail-coverts pale buff; underside of tail black and white, underside of flight-feathers pale silvery brown, underwing-coverts and axillaries buff; iris dark brown or russet; bill grey-black, slate or black; legs lead-grey or greyish-horn. Female is like male, but pink-carmine on throat and upper breast replaced by wide black gorget which extends as malar stripe up to corner of bill, enclosing large white area on chin and upper throat; below gorget a ragged pink-carmine patch, like that of male but narrower and shorter. Immature is like adult above, male has chin to breast white, a scattering of carmine feathers on lower breast, large grey-brown patch at side of breast, middle of belly white, feathers silkily fluffy, female like young male but gradually acquires black gorget, at first indistinctly as broad black malar stripes and a black dot in centre of breast, these soon joined together. Race *kordofanicus* is like nominate, but brown areas much paler and rather greyer, ear-coverts white with brown tinge, grading to white on cheek and throat; *hilgerti* also is like nominate but darker above, forehead to mantle and scapulars strongly tinged carmine, lores pale, supercilium and grey ear-coverts contrasting with pink-grey forehead, crown and hindneck, rump tinged carmine, male with chin carmine (not white) and carmine patch or patches from chin to upper belly stronger in tone and better demarcated; *cathemagmenus* is like previous, but male has black malar stripe and black gorget (like female), chin and throat carmine, sometimes a small buff or white tip on rectrix adjacent to central pair, female has comparatively small pink-carmine patch on lower breast. Voice. Various thin, piercing or chirping, quavering whistles, somewhat slurred and ventriloquial. Apparent territorial song a whistled duet between two males or a male and female, initiated with male's high-pitched "tzee" or "twee-u" or "tzwee-wee" notes, immediately answered by female with slightly lower "ter-ee" or "tzee-ur" notes, the two then alternating indefinitely; calling birds duet monotonously for long periods from top of bush, perching out in open or with only head visible; two pairs may duet together, males only a few centimetres apart. Alarm a harsh, grating "krrrr" and scolding "zwerrrrk-zwerrrrk" notes.

Habitat. Wadis with extensive acacia (*Acacia*) groves, hot coastal plains with acacia and dry, open, low thorn-scrub, lava fields, and arid bush and semi-desert with scattered shrubs; to 1970 m, mainly below 1300 m.

Food and Feeding. Insects, including beetles (Coleoptera) and grasshoppers (Orthoptera); some small fruits. Terrestrial, spending much time on open or almost bare ground not far from cover. Forages in surface litter, progressing in hops and bounds; runs fast over ground, and flies very low over it. Singly and in pairs, sometimes in small groups. Likes to keep out of sight, but restless; can be conspicuous and confiding.

Breeding. Breeds probably in response to rain, duetting common in spring and early summer; about Mar–Jun on Egypt–Sudan border (Jebel Elba), Oct–Nov in Sudan (Red Sea Hills), Nov–Mar and May in Eritrea, Sept–Apr in Ethiopia, Jan–Jul (mainly Jun) in N Somalia, and Apr–Jun and

Nov in Kenya. Probably territorial, but poorly known; two males often counter-sing, perched on bushtop or ground within 1 m of each other, one stretches legs, body and neck upwards and whistles, other performs similarly, the two alternating until a female arrives, then following her (on foot or on wing); individuals in small party chase each other around large stone, wings outstretched and tail fanned, and perch on dead bough, bobbing up and down and giving nasal 2-note call, seeming almost oblivious of observer. Nest an untidy shallow cup or platform, made from vegetable fibres, twigs and dry grass stalks or grass leaves, unlined, well concealed low down in thorn bush or small shrub, one covered with creeper (*Cissus rotundifolia*), sometimes in topmost foliage (e.g. of *Suaeda fruticosa* bush). Clutch 2–3 eggs; no information on incubation and nestling periods.
Movements. Resident. Possible movement in Red Sea Hills, in Sudan, where said to be common only seasonally. Race *hilgerti* recorded in or very near range of *cathemagmenus* in S Kenya (Tsavo), suggesting that some non-breeding individuals may wander.
Status and Conservation. Not globally threatened. Race *kordofanicus*, known only from three specimens collected in 1902 in Ogayeh Wells (near El Obeid), in Kordofan, and one individual seen near Wadi el Melik; may be close to extinction. Species locally common around Jebel Elba and in Red Sea Hills, in E Sudan; uncommon in extreme SE Sudan and Eritrea (coastal plains and Danakil and on R Baraka S to Karkabat); frequent in lowland C & S Ethiopia (to 1800 m). Common to abundant on coastal plain in Djibouti (more than twelve seen in a day in 20 km between Doralé and Loyada); in Somalia, very common in NW (to 1970 m) and common and probably widespread S to c. 2° N. In Kenya, possibly more widespread in E than currently realized; uncommon or locally frequent from coast and lower R Tana up to 1600 m (scarce above 1300 m). Locally fairly common in Tanzania from L Natron to lowlands N of Arusha, Ardai Plains, Tarangire National Park, Mkomazi Game Reserve and Masai Steppe S to Kondoa and Kilosa.
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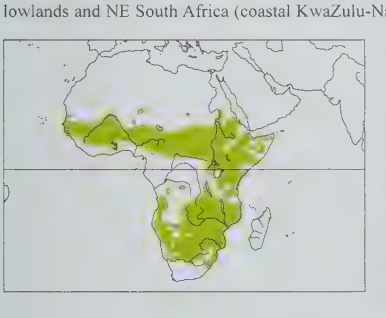
Genus *NILAUS* Swainson, 1827

47. **Brubru**

Nilaus afer

French: Brubru africain **German**: Brubruwürger **Spanish**: Brubrú
Other common names: Brubru Shrike; Southern Brubru (*brubru*); Northern Brubru (*afer*); Black-browed Brubru (*nigritemporalis*); Angola Brubru (*affinis*)

Taxonomy. *Lanius afer* Latham, 1801, Senegal.
An enigmatic, monotypic genus which has been placed variously in families Laniidae, Prionopidae and Muscicapidae; nest and tarsal scutellation like those of prionopids, and bill shape and juvenile plumage similar to those of laniids. Nest also very like those of *Batis* species (family Platysteiridae), as are white nape and back, fluffy rump and white wingstripe, in which respects this genus links present family and Platysteiridae; duet-singing and some aspects of breeding behaviour (destruction of own nest, parental sharing of nest duties), however, are typical of present family, and not of platysteirids. Race *massaicus* intergrades with nominate in NE Uganda (Karamoja); *nigritemporalis* intergrades with *affinis* and *brubru* in SE DRCongo (Katanga), and with *solivagus* in Zambia (middle Zambezi valley). Proposed race *hilgerti* (described from R Kassam, in E Ethiopia) synonymized with *minor*. Nine subspecies recognized.
Subspecies and Distribution.
N. a. afer (Latham, 1801) – S Mauritania and Senegal E to Eritrea and NW Ethiopia, S to NW & C Cameroon, W & NW Central African Republic and NW Uganda; dry-season visitor in coastal Liberia and Ghana.
N. a. camerunensis Neumann, 1907 – Cameroon highlands, S Central African Republic, and N & NE DRCongo (E to N end of L Albert).
N. a. minor Sharpe, 1895 – SE Sudan, SE Ethiopia, Somalia (except NE), plateau country in N & E Kenya (S to Kerio valley, Baringo, Isiolo, Tsavo and Taru), and NE Tanzania.
N. a. massaicus Neumann, 1907 – NE DRCongo, Uganda, Kenya (except N & E) and N Tanzania (Serengeti S to Shinyanga).
N. a. affinis Bocage, 1878 – N Angola and S DRCongo (Kasai, and Katanga E to Mt Kabobo).
N. a. nigritemporalis Reichenow, 1892 – E Angola, S & SE DRCongo and Tanzania (except far NW & NE) S to Zambia (except extreme SW), Zimbabwe (in middle Zambezi valley), Malawi and Mozambique (except extreme S).
N. a. brubru (Latham, 1801) – SW & W Angola, extreme SW Zambia, Namibia, Botswana, W Zimbabwe, N South Africa (W Limpopo S to extreme N Northern Cape and W Free State) and W Swaziland.
N. a. solivagus Clancey, 1958 – C plateau of Zimbabwe, SW Mozambique (W Sul do Save), N South Africa (N & E Limpopo, KwaZulu-Natal) and E Swaziland.
N. a. miombensis Clancey, 1971 – extreme SE Zimbabwe (around Marhumbini), SE Mozambique lowlands and NE South Africa (coastal KwaZulu-Natal).



Descriptive notes. 12·5–15 cm; male 17–32 g and female 18–30 g (*solivagus*); male 21–27 g and female 21–25 g (*nigritemporalis*), sexes combined 13–20 g (*minor*). Male nominate race has central forehead, crown, nape, and stripe from behind eye to side of neck black, side of forehead, lores and long broad superciliary stripe white, hindneck whitish; side of mantle black, scapulars black, rest of mantle and back rufous-buff with black spots; rump plumage very full, soft and fluffy, black and white (each feather with blackish tip, large white subterminal patch, dark grey base), uppertail-coverts black; tail black, outermost feather with white tip and white outer web, next two pairs with small white triangle at tip and white streak along outer edge, next pair with or without small white tip; upperwing black, primaries with narrow rufous-buff edges, tertials with broad warm rufous-buff outer edges, median and inner greater upperwing-coverts warm rufous-buff; cheek, chin, throat and underparts white, comparatively narrow dark chestnut line on side and flanks; underwing-coverts and axillaries white, blackish carpal patch; iris dark crimson-brown; bill black; legs grey. Female is like male, but black areas above duller and warm brown, rich rufous-buff tinge in white areas, narrow dark chestnut line from below eye running down sides of throat and breast to flanks, chestnut on flanks somewhat paler and less extensive, slight dark streaking from chin to breast. Juvenile plumage (of short duration) whitish with dark brown bars on forehead and crown, hindcollar buffy, mantle whitish with dark brown bars, back mainly white, tail dark brown and warm buff, wings warm dark buff, dull white below with widely spaced narrow dark vermiculations; immature crown dark brown with white speckles, white supercilium mottled dark brown, hindneck and sides of mantle and back dark brown with broken white bars and white speckles, centre of mantle and back with large white blotches, rump and uppertail-coverts dark brown and whitish, wings dark brown and pale buff, ear-coverts whitish with dusky speckles, dark line behind eye to hindneck, underparts white with irregular short dark brown bars and few rufous feathers at side. Races differ mainly in plumage coloration and pattern: *camerunensis* is like nominate but white areas on head and underparts more greyish, female chin to breast greyish-white and slightly dark-speckled; *minor* is similar to *brubru*, but smaller; *massaicus* resembles nominate but pale areas in upperparts white, cream or pale rufous, and chestnut line on side much wider and slightly paler, female dark brown and white above, dark line from eye down to side of breast; *nigritemporalis* has white forehead, black lores, short white anterior supercilium, pale areas above are white (not buffy), underparts like nominate but stripe on side rufous (not chestnut), female like nominate but light areas in upperparts pale buff, rufous line along side narrow and fragmentary; *affinis* short white anterior supercilium, pure white below without any rufous, female dark brown and creamy above, greyish-white with slight buffy wash below, chin to breast quite heavily streaked and speckled with black; *brubru* has lores white with black spots, pale areas above are white (not buffy or rufous), chestnut line on flanks paler, and broader, female dark brown and white above, lacks dark line from eye down to side of breast, line on side pale rufous and smaller than male's, chin to upper breast with blackish streaks and speckles; *solivagus* has blacker upperparts than previous, white on back tinged yellowish, underparts creamy (not white), chestnut stripe narrower and darker than in previous; *miombensis* male is like male *nigritemporalis*, female pure white below, unmarked on throat and breast, stripe along side reduced to small chestnut streaks. Voice. Male song, commonly heard, a repeated far-carrying, high-pitched trill lasting 0·5–0·8 seconds, varying regionally from fast buzz with individual notes barely discernible, "prrrrriiiii", to slower, telephone-like trill, "b-r-r-r-r-r-u-u-u-u-u", trill sometimes (especially in S Africa) preceded by up to 6 soft clicking notes, "tch-tch-wrrrrreeeee" or "wop-prrrrreeeee", song repeated up to c. 40 times; female responds erratically with few short, squeaky notes, usually synchronously with male's trill. Two males often counter-sing, using trills at different pitches, females joining in with repeated "eeeu-eeeu" and "tu-tu" calls; duets used for maintaining long-range contact, soft "pe-with" or "chip-chip" notes or harsh rasps for short-range contact. At least ten distinct calls known, including repeated short trills and wing-fripping in territorial encounters, a repeated penetrating "piep-piep-piep..." by both sexes; nasal "naaa-naaa" notes; rapidly-repeated "chk-chk-chk..." and rasping "tzzrr" in alarm; in E Africa a long rapid chatter, "chatatatatatata...". Often frips wings loudly and excitedly.
Habitat. Varies regionally, from canopy of mature *Brachystegia*, *Colophospermum*, *Combretum* with *Terminalia* and other broadleaf woodlands in mesic areas to flat-topped acacia (*Acacia*) woods and scrub in arid environments; occurs in 11 out of 17 woodland types in Botswana; often in open park-like country. In desert areas occurs in small, isolated clumps of thorn trees. At 1000–1500 m in Uganda, 530–2120 m in Ethiopia, and to 1360 m in Eritrea.
Food and Feeding. Invertebrates, including moths and caterpillars (Lepidoptera), ants (Formicidae), beetles (Coleoptera), grasshoppers (Orthoptera), flies (Diptera) and spiders (Araneae). Unobtrusive, never gregarious; spends nearly all of its time in foliage, often near tops of emergent broadleaf or microphyllous savanna trees. Flight fast and undulating, at or above treetop level. Pair-members often forage far apart; silent for long periods when foraging. Active, gleaning foliage and branches in canopy; quite acrobatic, feeding in manner of a tit (Paridae), with body at all angles, sometimes head down or completely upside down as it investigates leaf sprays, inflorescences or pods at tips of branches. Occasionally hawks insects in air. Holds large prey item under one foot in order to deal with it. Often joins mixed-species foraging flocks.
Breeding. Season about Jun–Nov in Gambia and Mali, about Jan–Feb in Ghana and Nigeria, May in Niger, Feb in Chad, Apr–May and Nov in Sudan, Apr in Ethiopia, Apr–May in Somalia, about Jan–Feb in DRCongo, May–Jul in Uganda; Mar, May, Jul, Sept–Oct in Kenya (E of Rift Valley) and NE Tanzania, Oct–Dec in rest of Tanzania; Sept–Jan (mainly Sept) in Zambia, Aug–Sept and Mar in Malawi, Oct–Nov in Namibia, Oct–Feb in Botswana, Sept–Jan (mainly Sept–Oct) in Zimbabwe; in South Africa, Aug–Jan in former Transvaal and Sept–Dec in KwaZulu-Natal. Pair defends permanent territory of 33–42 ha, advertises it by singing all year; disputes between neighbouring pairs common, with chasing and supplanting, intense territorial interactions involving counter-singing and zigzag display-flights with wing-fripping and deep, rather slow wingbeats, also (when perched) bowing and rapid side-to-side movements of body; male sings from exposed treetop perch, with body inclined, head raised, neck outstretched, crown and throat feathers raised, tail slightly fanned. Courtship incorporates elements of territorial behaviour; in sexual display, male perched with food in bill and gave series of high-pitched "tuet-tuet-tuet" calls interspersed with "prrreeee" trills, then flew to female, sidled up to her and the two copulated. Nest-building shared by sexes (see page 76), building takes two days, shaping a further four days (eggs laid up to four days later); a small, neat, not very deep, open cup made from bits of fine pliant leaf petioles, twigs, tendrils and pieces of bark, felted together with spider web, generally covered profusely on outside with bits of foliaceous lichen (two nests each made entirely of three materials: spider web, c. 95 pieces of lichen, and up to 550 petioles); placed usually on two-pronged or three-pronged fork on gently sloping branch (c. 7 cm in diameter) 2·5–9 m up in tree, often *Terminalia sericea* or *Burkea africana* (at Nylsvlei, Transvaal), nest often highly cryptic on lichenous substrate; strong tendency to abandon early nests without laying in them (one pair built and destroyed three nests in four weeks, starting fourth nest near end of that time and laying in it). Clutch 2–4 eggs, generally 2, second laid 26–27 hours after first; incubation from first egg, by both sexes, for 98% of daytime, by female rather more than by male, only female at night; stints last 17–178 minutes (average 42 minutes), when female sitting male initiates change-over by calling as he approaches, she responding in duet; when male incubating he initiates change-over by calling on nest, female arriving immediately and taking over; incubation period c. 19 days; chicks brooded by either parent, continuously for first 6–7 days, sporadically for next 3–4 days, thereafter only at night, fed by both, faecal sacs removed and eaten by either parent, nestling period 21–22 days; young stay with parents for c. 55 days after leaving nest, remain in parental territory but not accompanied by parents. Of ten nests in one study, only three were successful. Longevity at least 8 years.
Movements. Mostly resident. Partial migrant in W Africa, dry-season visitor late Oct to mid-Mar in coastal Liberia and on Accra Plains, in Ghana; thought to be migratory in Ouaddaï region of

Chad, where occurs Jul–Sept; common resident in Ennedi hills, in Sahara, but perhaps also partial migrant there.

Status and Conservation. Not globally threatened. Common in many parts of its vast sub-Saharan range. Uncommon in Togo. Global population perhaps in low millions; probably more than 100,000 individuals in S Mozambique. In S uncommon to locally very common; densities of 1 pair/30–50 ha in former Transvaal (South Africa), 1 bird/9 ha in eleven woodland types in N Botswana and 1 bird/4 ha in tall acacia woods in Okavango; four localities in acacia savanna in Swaziland held, respectively, 3, 11, 24 and 30 birds/100 ha.

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Genus *LANIOTURDUS* Waterhouse, 1838

48. White-tailed Shrike

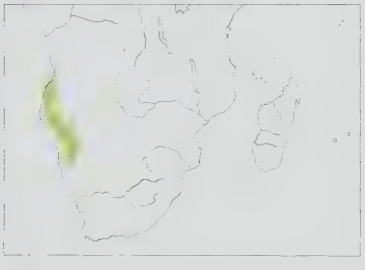
Lanioturdus torquatus

French: Lanielle à queue blanche **German**: Drosselwürger **Spanish**: Laniotordo
Other common names: Chatshrike, Flycatcher Shrike

Taxonomy. *Lanioturdus torquatus* Waterhouse, 1838, Bull's Mouth Pass, Naukluft Mountains, Damaraland, Namibia.

Affinities uncertain. Originally thought to be an aberrant member of present family, with which it shares several cranial and limb-bone characters and is similar in various aspects of behaviour; has sometimes been placed with Old World flycatchers (Muscicapidae), and eggs resemble those of helmet-shrikes (Prionopidae). Plumage pattern and nest, however, strongly reminiscent of batises (*Batis*), and some structural characters, e.g. jaw musculature, shared with those and wattle-eyes (*Platysteira*), both in family Platysteiridae; recent molecular-genetic studies corroborate close relationship with *Batis*, and the species is possibly better assigned to Platysteiridae (see HBW 11, page 164). Monotypic.

Distribution. SW Angola and NW & C Namibia.



Descriptive notes. 14–15 cm; 23·5–45 g. A small, large-headed and short-tailed bush-shrike with long legs, somewhat crested appearance. Forehead is white, lores and crown to nape, hindneck and ear-coverts black, slightly glossy, hindneck with long narrow white horizontal patch in mid-line; mantle to uppertail-coverts blue-grey, dappled with white, rump feathers and uppertail-coverts long and fluffy; tail white, feathers rather stiff, central pair with long teardrop-shaped black mark on distal half; upperwing black, with white bases of primaries and small white tips on all flight-feathers, white greater and median secondary coverts and greater primary coverts, but outermost greater covert black, generally small white tips on alula feathers, and small white patch on leading edge near bend of wing; chin, throat and side of neck white, sharply demarcated; slightly glossy black band (c. 7 mm deep in middle, narrowing to point at side) across upper breast, lower breast blue-grey at side and paling to off-white in middle; upper flanks blue-grey, rest of lower underparts white; iris yellow or greenish-yellow; bill and legs black. Sexes alike, male perhaps fractionally larger than female. Juvenile is like adult, but hindneck mottled, breastband narrower, eyes brown. Voice. Male song a mix of two notes, a penetrating high-pitched, querulous crescendo whistle, "eeee", "oo-eee" or "hooou", lasting 0·5 seconds, repeated up to five times, and an abrupt liquid "tewp" or "tiu" (lower than the "eeee") sounding like that of a *Lamprotornis* starling; one 25-second song consisted of three, one and six whistles alternating with one and ten "tewp" notes, separated by variable-length pauses; some whistles double, the second note following without pause but lower-pitched and quieter. Female song a number of low-pitched discords "tchzrr" or "kichurrr" at irregular intervals, synchronously with male's song; in aforementioned 25-second song, female uttered five "tchzrr" notes interpolated only with male's "tewp" calls (not with his whistles). Contact call a hollow metallic "chink", by either sex. In high-intensity territorial interaction male has ratchet-like "ch-ch-kkkk-kkkkkk..." rattle (duration more than 2 seconds); another territorial note is nasal "kzzzzp, kzzzp" by male and "ktchzrrr" by female; also discordant "chuk" notes when going to roost, slow "chuk'chuk" in apprehension, and counter-sung whistles and nasal and ratchet notes in threat; nasal "chk-chk-chk-chk..." stutter in alarm, explosive "skzeer, skzeer" in high-intensity alarm, and "heee-u" whistle on approaching and while guarding nest. Male makes fripping sounds with wings in display-flights.

Habitat. Climax and degraded brachystegia (*Brachystegia*) woodland, *Terminalia sericea* and teak woods on sandy soils in N of range; in S occurs in mopane (*Colophospermum mopane*) woods, *Combretum imberbe* woodland, *Commiphora* and acacia (*Acacia*) thornbush-scrub and savanna, mainly in denser patches of woody growth on rocky hillsides and along watercourses.

Food and Feeding. Insects, including beetles (Coleoptera), moths, butterflies and caterpillars (Lepidoptera), mantids (Mantidae) and grasshoppers (Orthoptera); drinks only rarely. Terrestrial and arboreal; forages in low, dense vegetation and on ground beneath, also commonly in trees at all levels up to canopy, 25 m above ground. Active, shy but inquisitive. Gleans insects from trunks, branches and foliage, where sometimes hangs momentarily upside-down when feeding; occasionally flies out to catch insect in flight. On ground moves restlessly, hopping in long bounds, short tail pointing straight down, seizing prey from soil surface or jumping up to take insect from tip of grass stem. Singly and in pairs, in winter also in flocks of up to twelve individuals; joins mixed-species foraging flocks; in Angola (N Huíla), group forages on ground often with White-headed Black-chats (*Pentholaea arnotti*), Sharp-tailed Starlings (*Lamprotornis acuticaudus*) and White-winged Babbling Starlings (*Neociehla gutturalis*).

Breeding. Birds in breeding condition in Nov–Dec and eggs in Feb in Angola; Sept–Apr (mainly Feb–Mar) in Namibia. Male advertises and defends territory of c. 5 ha with loud, ringing crescendo whistles delivered from exposed bushtop or treetop, female sings antiphonally, both calling with raised bill and upstretched neck; competing males counter-sing at territory border, females often joining in; threaten intruder by adopting horizontal posture and glaring at it. In courtship display-flight male rises steeply with rapid wingbeats, then descends in bouncing glide, rump feathers fluffed out, repeatedly whistling; pursues female in low flight, climbing up through a bush, counter-singing, or hopping along ground, the two sometimes hopping in tandem. Nest built by both sexes, mainly female, taking c. 6 days, a neat deep cup, rounded and smooth, external diameter c. 75 mm, made from fine dry grasses and bark strips bound and plastered with spider web, scantily lined with fine grass stems; placed 0·4–8 m (generally c. 3 m) above ground on horizontal branch or in fork in canopy of acacia or other small tree, often quite exposed if tree leafless. Clutch 1–3 eggs; incubation by female, well concealed and very confiding, fed on and off nest by male; he arrives on nearby tree and utters trilling call, she immediately leaves nest, joins him and sometimes solicits with quivering wings, takes offered food, hops about with him for few minutes, returns to nest tree cautiously and indirectly, and resumes incubation; incubation period 15 days; chicks initially fed by female with food brought by male, after a few days fed by both parents, nestling period 19–21 days; fledglings dependent on adults for at least two weeks after leaving nest, and remain in parental territory for at least 19 weeks.

Movements. Mainly resident. In Namibia, some move into dry riverbeds and greener suburbs in winter; in Angola thought to be partial migrant into miombo woodlands in Apr–Aug, being uncommon there in Oct–Mar.

Status and Conservation. Not globally threatened. Common in Angola from NE Benguela S along coastal plain and escarpment to Namibe town, thence E to N Huíla and S to Cunene; sight record from NW of Funda, in Bengo Province; common in Iona National Park, in Namibe Province. In Namibia, common from R Cunene S through interior to Windhoek, Tsondab and R Sossus; Namibian population estimated at 1,500,000 individuals. Possibly expanding its range to E as a result of continuing desertification.

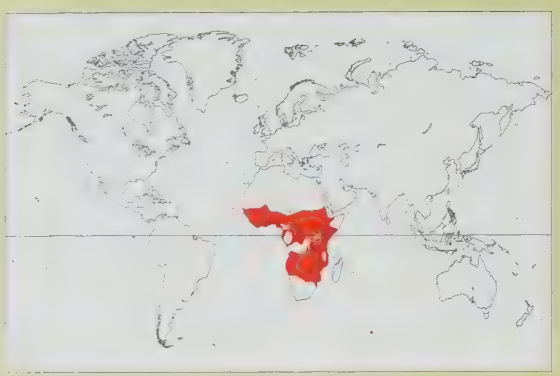
Bibliography. Beresford *et al.* (2005), Clancey (1970, 1980a), Dean (2000b), Dean *et al.* (2003), Dedekind (1987, 1991), Dowsett & Dowsett-Lemaire (1993), Dowsett & Forbes-Watson (1993), Fishpool & Evans (2001), Hall (1960b), Hall & Moreau (1970), Harris (1986), Harris & Arnott (1988), Harris & Franklin (2000), Harrison *et al.* (1997), Hoesch & Niethammer (1940), Jarvis & Robertson (1997), Joerges (1972), Mackworth-Praed & Grant (1963), Maclean (1993), Praetorius (1988), Priest (1948), Roberts (1946), Robertson *et al.* (1995), Sibley & Monroe (1990), Sinclair & Ryan (2003a), Sinclair & Sinclair (1995), Steyn (1996), Tarboton (2001), Traylor (1963), Urban *et al.* (1997), White (1962).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family PRIONOPIDAE (HELMET-SHRIKES)



- Medium-sized passerines with squat, hunched appearance, broad rounded wings, hook-tipped bill, tarsus scutellated on both sides and front, most species crested; plumage largely black, white, grey and brown, most with colourful eyewattles.
- 16–26 cm.



- Sub-Saharan Africa.
- Forest, woodland and savanna.
- 1 genus, 8 species, 19 taxa.
- 2 species threatened; none extinct since 1600.

Systematics

The family comprising the helmet-shrikes (Prionopidae) is confined to the Afrotropics. All eight of its members are placed in the one genus, *Prionops*. This generic name refers to the ragged, fleshy orbital rings characteristic of most of the species, *prion* meaning "saw" and *ops* signifying "appearance".

For many years, the systematic position of the helmet-shrikes has been notoriously obscure. Until relatively recently, they were viewed as a subfamily of the Laniidae, which was previously considered a large and diverse family that included all of the shrike-like passerines of the Old World. The only unifying features of the original members of this expanded Laniidae, however, were a hooked bill and a reduced muscle in the hind limb (Musculus flexor perforatus digitii III). Past treatments have placed the helmet-shrikes between the "true shrikes" (*Lanius*) and the malaconotid "bush-shrikes", between the Madagascan vangas (Vangidae) and the bush-shrikes, between the bulbuls (Pycnonotidae) and the bush-shrikes, and between the cuckoo-shrikes (Campephagidae) and some of the bush-shrikes. Particularly distinctive attributes of the helmet-shrikes that have featured constantly in systematic treatises are the unusual pattern of tarsal scutellation, a strikingly communal gregariousness at all times, and the nest structure.

More recently, information from DNA–DNA hybridization studies suggested that both the helmet-shrikes and the bush-shrikes are quite distantly related to the true shrikes, and that the helmet-shrikes cluster with the Asian wood-shrikes (*Tephrodornis*) and the vangas, close to the batises (*Batis*), the wattle-eyes (*Platysteira* and *Dyaphorophyia*) and the Asian philentomas (*Philentoma*). These findings are supported by behavioural, morphological and biochemical comparisons.

Traditional approaches have tended also to include the two *Eurocephalus* white-crowned shrikes in the same subfamily as the helmet-shrikes. This treatment was based largely on putative similarities between the two groups in head plumage, tarsal scutellation, juvenile plumage, nest architecture, nesting habits, displays, gregariousness and flight action. It is now appreciated, from morphological, osteological and behavioural studies, and from the findings of DNA–DNA hybridization studies, that *Eurocephalus* lies firmly within the group of true shrikes in a restricted family Laniidae, of which the remaining two genera are *Lanius* and *Corvinella*, the genus *Urolestes* being subsumed in the latter. In past traditional treatments, the Brubru (*Nilaus afer*), currently included in Malaconotidae, and the wood-shrikes, at present in Campephagidae, have also been placed in the same subfamily as the helmet-shrikes, again apparently on the grounds of the tarsal scutellation.

Most recently, detailed molecular-genetic investigations, including analyses of both nuclear and mitochondrial DNA, have largely corroborated and refined the information provided by the earlier studies of behaviour, morphology and DNA–DNA hybridization. They suggest that the helmet-shrikes form a group with the Asian wood-shrikes, the philentomas, the poorly known African flycatcher-shrikes (*Bias* and *Megabyas*) and the vangas. Furthermore, these studies have indicated a hitherto unsuspected direct link with the Asian flycatcher-shrikes (*Hemipus*), traditionally viewed as members of the family Campephagidae, although a taxonomic link of this taxon to the Laniidae had earlier been argued.



Helmet-shrikes have the head relatively large and present a typically hunched appearance when at rest. The ***Chestnut-fronted Helmet-shrike*** *is the smallest member of the family at 16–18 cm and 20–40 g; the others range up to 26 cm and 49 g. It has a small, neat chestnut crest on its forehead. This species is one of five with a brightly coloured bill. Although sometimes found flocking with the similar Retz's Helmet-shrike* (Prionops retzii), *it is rather isolated from most other members of the family, being largely confined to the coastal strip between south Somalia and southern Mozambique.*

[*Prionops scopifrons kirki*, Arabuko-Sokoke Forest Reserve, Kenya. Photo: Steve Garvie]



The five subspecies of the ***White-crested Helmet-shrike*** *differ markedly in size, the length and shape of the crest, and the presence or absence of a white wingbar on the folded wing. With limited evidence of hybridization between subspecies, it is possible that this taxon comprises more than one species. All eight helmet-shrike species are currently placed in the genus* Prionops. *Once considered a subfamily of true shrikes (Laniidae), DNA studies suggest that they are quite distantly related, and much closer to groups such as the Asian wood-shrikes* (Tephrodornis)*, vangas (Vangidae) and wattle-eyes (Platysteiridae).*

[*Prionops plumatus poliocephalus*, Kruger National Park, South Africa. Photo: Warwick Tarboton]

Indeed, the wood-shrikes and Asian flycatcher-shrikes, followed by the philentomas, may be the helmet-shrikes' closest relatives, and these three Asian genera probably stem from one or two colonization events from Africa to Asia, following an ancestral colonization of Africa, through Asia, of original Australian corvoid stock. A potential link between the helmet-shrikes and the vangas had previously been mooted, based on bill structure, jaw musculature, tarsal scutellation and gregarious habits. The finding that the African flycatcher-shrikes, *Bias* and *Megabyas*, are closer to helmet-shrikes than to batises and wattle-eyes is, however, surprising. In these studies, the group containing the helmet-shrikes was one of three forming a distinct clade. The second group comprised the White-tailed Shrike (*Lanioturdus torquatus*), the batises and the wattle-eyes, and the third contained the bush-shrike genera *Malaconotus*, *Chlorophoneus*, *Laniarius*, *Rhodophoneus*, *Telophorus* and *Bocagia*, the puff-backs (*Dryoscopus*), the tchagras (*Tchagra*) and the Brubru. The genus *Bocagia*, incidentally, is often subsumed in *Tchagra*, and *Rhodophoneus* has recently been merged with *Telophorus*. All the members of these last two groups are confined to the Afrotropics.

Understanding of species limits and relationships within the helmet-shrikes has proved almost as challenging as the higher-order placement of these passerines. The Red-billed (*Prionops caniceps*), Rufous-bellied (*Prionops rufiventris*), Retz's (*Prionops retzii*), Gabela (*Prionops gabela*) and Chestnut-fronted Helmet-shrikes (*Prionops scopifrons*) have previously been united in the genus *Sigmodus*. The argument for this treatment was primarily that these species differ from the remaining three prionopids in having a brightly coloured bill and a reduced crest, with an additional possible difference, specifically between the Rufous-bellied Helmet-shrike and the White-crested Helmet-shrike (*Prionops plumatus*), in jaw musculature and nestling plumage; further, a possible difference in begging calls between the White-crested Helmet-shrike on the one hand and, on the other, Retz's and Chestnut-fronted Helmet-shrikes has recently been proposed. It is widely conceded that the White-crested and Grey-crested Helmet-shrikes (*Prionops poliolophus*), the Red-billed and Rufous-bellied Helmet-shrikes, and Retz's and Gabela Helmet-shrikes form three respective superspecies, but the grouping of the somewhat aberrant and poorly known Yellow-crested Helmet-shrike (*Prionops alberti*) close to the first of these superspecies is more controversial.

At the species level, it is possible that the most widespread member of the family, the White-crested Helmet-shrike, may comprise more than a single species. This taxon exhibits fairly extensive geographical variation across several quite distinctive subspecies. Differences in both the length and the shape of the crest feathering, the presence or absence of a white bar in the folded wing, differences in vocalizations and size, and apparently limited evidence of hybridization between some of the subspecies, prompt further investigations in this regard. The recognition of the Red-billed and Rufous-bellied Helmet-shrikes as two separate species, as in the present arrangement, is by no means uncontested. For example, the largely clinal nature of plumage variation across the four relevant subspecies, coupled with similarities in vocalizations, suggests that this division requires further confirmation. Both species have common double whistles and a "kyop-kyop" vocalization, but the "watch-winding" call of the Red-billed Helmet-shrike has not been recorded for the Rufous-bellied Helmet-shrike, and a "chaja" call of the latter taxon is not known to be produced by the former. Verification of the specific status of the poorly known Gabela Helmet-shrike as a full species has also been called for, some authorities suggesting that this form should be treated as a subspecies of Retz's Helmet-shrike.

Morphological Aspects

Helmet-shrikes are medium-sized passerines, 16–26 cm in total length, with fairly uniform proportions. They are shrike-like in general appearance, having a relatively large head and a rather squat and hunched appearance when at rest. The sexes are alike, and there are no seasonal differences in plumage.

The feathers on the forehead of prionopids are stiffened, and some project forwards over the oval-shaped nostrils. Similar feathers extend to the crown, and on some species, especially the dark-beaked ones, they form a distinctive crest up to 45 mm in length. The English vernacular name for the family stems from these unusual head adornments. The feather pigments on the head are unstable, and on study skins are easily washed out with soap. Plumage colours tend to be a combination of black, white, grey and sometimes brown. The black upperparts of the White-crested, Grey-crested, Yellow-crested, Red-billed and Rufous-bellied Helmet-shrikes are glossed greenish. Interestingly, the closely related wattle-eyes (see Systematics) also have greenish-tinged upperparts and, of course, similar eye adornments. In the folded wing, the White-crested and Grey-crested Helmet-shrikes have a white wingbar formed by white in the secondaries and upperwing-coverts, but, intriguingly from a systematic point of view, this is

absent in the eastern races *cristatus* and *vinaceigularis* of the former. The Yellow-crested Helmet-shrike is unique in the family in having yellow in the plumage.

Helmet-shrikes have broad and rounded wings, each of which has ten primaries. Counting from the innermost outwards, primaries P8–P5 are the longest and P10 is half the length of P8. The flight action is distinctively buoyant and dipping, with much gliding, and is decidedly fluttering and butterfly-like. Groups move through the woodland in a leap-frog fashion, those individuals at the rear continually flying forwards and supplanting those at the front. Characteristically, there is a striking white bar through the primary feathers that is highly noticeable in flight, although this feature is reduced or absent on Yellow-crested and Gabela Helmet-shrikes, on the subspecies *graculinus* of Retz's Helmet-shrike, and on the two races *kirki* and *keniensis* of the Chestnut-fronted Helmet-shrike. The tail consists of twelve rectrices, and five of the eight species, the exceptions being the Yellow-crested, Red-billed and Rufous-bellied Helmet-shrikes, show much white in the tail, especially towards the outer feathers. Thus, there is some tendency for the species most associated with forested environments to have a reduced amount of white in the wings and tail. The undertail-coverts of helmet-shrikes are unusually plush.

A distinctive feature of the Prionopidae is the bill, which is stout, and hooked at the tip, with a notch at the base of the hook on the lower surface of the upper mandible. Five species have a bright reddish bill, that of the remaining three, the White-crested, Grey-crested and Yellow-crested Helmet-shrikes, being blackish. The base of the bill is fringed with the long, widely radiating rictal bristles that are associated with the habit of feeding on aerial insects. Most members of the family possess bright pectinate, or scalloped, orbital rings, which are yellow, orange, red or greyish-blue in colour, and the iris is typically bright yellow. There is some evidence, provided by the White-crested and Retz's Helmet-shrikes, to suggest that the dominant breeding pair in a group sports the best-developed orbital rings, as well as boasting the heaviest body weights. Interestingly, orbital rings are reduced or absent on three species, namely the Grey-crested, Red-billed and Rufous-bellied Helmet-shrikes. Finally, the helmet-shrikes are unusual in having tarsi that are scutellated on both the sides and the front. The legs and feet are short but strong, designed for arboreal life, and normally bright reddish in colour, and the claws are sharp.

Juveniles typically appear bewilderingly unlike the adults, as they initially lack the features characteristic of helmet-shrikes, in particular the crest, the orbital rings, well-defined head markings and brightly coloured eyes, legs and feet. Moreover, they have duller and browner plumage, frequently with barring and mottling, which is absent on the adults. Although the details are poorly known, juveniles probably moult directly into adult dress, a process complete only by the time when they are about one year of age. It has been suggested, however, that Retz's Helmet-shrike has an intervening immature plumage, thus apparently extending the period before the acquisition of full adult plumage to two years, but this requires confirmation.

Habitat

The helmet-shrikes inhabit environments with a good cover of trees, as provided by woodland, savanna and forest.

White-crested, Grey-crested and Retz's Helmet-shrikes are characteristic of deciduous woodland and savanna. Examples of the normal woodland types inhabited by the White-crested and Retz's Helmet-shrikes include "teak" (*Baikiaea*), miombo (*Brachystegia*), mopane (*Colophospermum*), bushwillow (*Combretum*), bloodwood (*Pterocarpus*), cluster-leaf (*Terminalia*) and *Burkea* woodlands. Of the two, the White-crested Helmet-shrike is the more tolerant of the least well-developed savanna in the driest regions, and hence, in the Afrotropical context, is the most widespread of the Prionopidae. This species and Retz's Helmet-shrike, the latter the next most widespread member of the family, also display an obvious preference for broadleaf woodland over acacia (*Acacia*) woodland. Outside the breeding season, however, both of these helmet-shrikes, especially the White-crested, will wander widely into other habitats, such as coastal and riparian forest and forest edge, thickets, scrub, lightly wooded grassland, mangroves, and plantations of oil palm (*Elaeis guineensis*), eucalypt (*Eucalyptus*) and pine (*Pinus*), and will even enter gardens and urban areas.

The poorly known Grey-crested Helmet-shrike, restricted to a small area of Tanzania and adjacent Kenya, inhabits whistling-thorn (*Acacia drepanolobium*) and camphor-bush (*Tarchonanthus*) savanna, and riverine woodland. It prefers better-developed, higher-rainfall woodland than that occupied by the White-crested Helmet-shrike, which it replaces locally at higher altitudes.



The generic name Prionops *means "saw-appearance", and refers to the ragged, fleshy wattles around the eyes. There is evidence from* **Retz's Helmet-shrike** *that the dominant breeding pair in a group have the most developed eye wattles. The colour of the wattles varies between species: in Retz's, it is orange-red, matching its bill; in the White-crested Helmet-shrike* (Prionops plumatus) *it is yellow; and in the Chestnut-fronted Helmet-shrike* (Prionops scopifrons) *it is grey-blue. Iris colour in all these species is yellow. Helmet-shrikes also have a strong, stout bill with a hooked tip, and a corresponding notch in the lower mandible.*

[*Prionops retzii retzii*, Save Valley Conservancy, Zimbabwe.
Photo: Peter J. Ginn]



Helmet-shrikes have broad, rounded wings. Their flight action is buoyant and dipping, with much gliding. Most species have a striking white bar through the primaries that is very noticeable in flight. Some, like the ***White-crested Helmet-shrike****, also have white outermost tail feathers. In this species, the tips of the black inner tail feathers are also white, except on the central pair, which are completely black.*

[*Prionops plumatus plumatus*, Western Division, Gambia. Photo: Dick Forsman]

Yellow-crested, Red-billed, Rufous-bellied, Gabela and Chestnut-fronted Helmet-shrikes are essentially denizens of forest, although the last two of these species will also wander into woodland areas. The poorly known Yellow-crested Helmet-shrike, a western Albertine Rift endemic restricted to far eastern DRCongo, inhabits montane forest, *Hagenia* and bamboo forest and, at lower altitudes, primary rainforest. Its altitudinal range is mainly 1400–2500 m, but the type specimen was apparently first discovered in atypical habitat at about 4400 m in the alpine zone. In contrast, the Red-billed and Rufous-bellied Helmet-shrikes are inhabitants of lowland forest in, respectively, West and Central Africa. Neither is entirely confined to primary forest, and both are regularly recorded in mature secondary forest, dense riverine vegetation, forest edge, logged forest and farmland, and old coffee plantations. The former species occurs at up to 700 m in Guinea, and the latter is recorded at up to 1450 m in DRCongo. The habitat requirements of the poorly known Gabela Helmet-shrike are not well understood. This species is restricted to a small region associated with the western Angolan escarpment, where it has been found in fairly dry forest, gallery forest and secondary forest, as well as in thickets and clearings, including coffee plantations in forest. It is apparently absent from nearby miombo woodland inhabited by the closely related Retz's Helmet-shrike.

The Chestnut-fronted Helmet-shrike is largely confined to the coastal strip along the eastern seaboard of Africa between south Somalia and southern Mozambique. It can occur as high up as 1200 m, but it lives mainly in lowland and riverine forest and adjacent miombo woodland, occasionally wandering to thickets and mangroves. It prefers better-developed woodland than that inhabited by Retz's Helmet-shrike. It is usually found close to the coast, but extends far inland in places: it is found, for example, in the Meru and Ngaia forests, in central Kenya; it occurs in the eastern Usambara, Uluguru and Udzungwa (Magombera and Mwanihana) Mountains and the Pugu Hills, in eastern Tanzania, from where there is a single record also from the north Pare Mountains; and it is recorded at the confluence of the Haroni and Rusitu Rivers, in eastern Zimbabwe.

General Habits

The helmet-shrikes are a poorly known family of birds. This is reflected in the paucity of primary literature reporting the results of field studies of these species. An ignorance of the general biology of the Yellow-crested and Gabela Helmet-shrikes is understandable when one bears in mind these species' limited ranges in highly inaccessible regions. Similarly, the Grey-crested Helmet-shrike has a remarkably truncated distribution. It is present, if not common, in some East African localities well frequented by ornithologists, but it is, however, easily mistaken for the White-crested Helmet-shrike. The heavily forested habitats and, for the most part, not easily accessible ranges of the Red-billed and Rufous-bellied Helmet-shrikes likely retard the study of these two attractive species. The Chestnut-fronted Helmet-shrike is only slightly better known.

Not surprisingly, the two best-known members of the family, the White-crested and Retz's Helmet-shrikes, are also the most widespread, and they inhabit the most open environments, which further facilitates study of their behaviour. These two helmet-shrikes also extend widely into southern Africa, a region of the continent in which ornithological research has been particularly good. Most of what is currently known about helmet-shrike biology comes from studies of these two species, especially the White-crested Helmet-shrike.

One of the most characteristic features of helmet-shrikes is their intensely social habits. All of the species live permanently in tightly knit groups of up to about 30 individuals, although some of the records of the largest group sizes may represent temporary aggregations of more than one group. For all members of the family, typical groups rarely contain more than about twelve individuals, and generally consist of about half that number. Groups tend to be larger immediately after the breeding period, when they are bolstered by the most recent crop of fledged juveniles. Records of solitary individuals or pairs are unusual. Group activities are regulated by a strict dominance hierarchy, headed by the alpha female.

All aspects of helmet-shrike life throughout the year, including breeding, territoriality, feeding, roosting and defence against predators, are communal in nature. During foraging forays, some individuals apparently act as sentries while others feed. Helmet-shrikes roost closely bunched together on branches in a leafy tree, such as an acacia, an apple-leaf (*Philenoptera*) or a tulip-tree (*Thespia*), among others.

Prionopids scratch indirectly, bringing the leg up over the wing, during maintenance behaviour, and they are known to bathe in pools of water trapped in vegetation. Otherwise, the general habits of this family are more or less unknown.

Voice

The vocalizations of the helmet-shrikes are one of the most remarkable features of the family. These are very noisy birds, with an astonishing array of calls, many of which are decidedly unavian in tenor. This garrulousness is doubtless directly related to the intensely social nature of the helmet-shrikes. A list of adjectives used by observers to describe helmet-shrike vocalizations gives some idea of the variety and tones represented, for the sounds have variously been said to be: bubbling, buzzing, chanting, chattering, chip-

ping, chomping, chuckling, churring, clicking, gobbling, grating, growling, guttural, harsh, hoarse, humming, leathery, nasal, piping, rattling, rolling, scolding, scratchy, screaming, shrill, slurred, squealing, tinkling, trilling, twittering, whirring, whistling and winding. In numerous cases, the same adjectives have been applied to the vocalizations of several different *Prionops* species.

Although the vocal behaviour of the White-crested Helmet-shrike has received the most study, followed by that of Retz's Helmet-shrike, the details are still poorly known. At least 20 different calls have been documented for the former and at least 16 for the latter. Vocalizations appear to be important in regulating social interactions within a group, and some calls may reflect individual social and gender status. Helmet-shrike calls have been likened to those of some barbets (Capitonidae), honeyguides (Indicatoridae), cuckoos (Cuculidae), nightjars (Caprimulgidae), crows (Corvidae) and Old World orioles (Oriolidae). Despite the highly vocal nature of these passerines, however, mimicry by helmet-shrikes has not been recorded.

Perhaps the nasal and flute-like whistling qualities, often disyllabic, of many helmet-shrike calls are the most characteristic. Vocalizations are typically given in duet or group chorus. Duetting apparently plays a role in maintaining the pair-bond between the dominant breeding male and female. Chorusing usually starts out fast, high-pitched and complex, winding down to slower, lower-pitched and simpler calls. The dominant group-members, especially the alpha female, apparently initiate most bouts of chorusing. Territory defence, greeting and contact seem obvious functions of chorusing. Other contact calls include soft nasal and simple high-pitched notes, given in flight. Lost individuals, separated from the rest of the group, may emit a louder, prolonged call. Chattering and chucking calls are uttered when an individual or group locates particularly desired food items and nesting material, although they may be uttered also in the face of predators. Similarly in alarm, helmet-shrikes produce other low, growling and churring sounds, which can escalate into sharp, shrill screams and squeals. Soft growling notes, and chuckling sounds, are associated also with roosting, when the birds huddle together on branches. Begging calls by young helmet-shrikes consist of low chattering and buzzing vocalizations, which serve also during courtship, when the breeding male may direct soft chick-like calls at the breeding female.

Another highly distinctive and characteristic sound made by helmet-shrikes is that produced by beak-snapping, which can be loud and prolonged. Beak-snapping is often interspersed with vocalizations, and is associated especially with alarm and aggression, but it may, at low intensity, have the function also of contact. The wings of the closely related Red-billed and Rufous-bellied Helmet-shrikes produce soft but clearly audible mechanical "wing-fripping" sounds in flight, and this, too, likely serves a contact function.

Food and Feeding

The diet of all helmet-shrikes consists predominantly of adult and larval invertebrates, especially insects. Vertebrate prey, such as geckos (Gekkonidae) and other small lizards, is taken occasionally. Fruits and seeds, such as those of *Musanga*, croton (*Croton*) and ochna (*Ochna*) trees, have been recorded in the diet of the White-crested, Red-billed, Rufous-bellied and Chestnut-fronted Helmet-shrikes, and they may be consumed more commonly by the species that inhabit forest compared with those in savanna. There are very few records of drinking by prionopids.

Documented invertebrate prey of the Prionopidae include ants (Formicidae), ant-lions (Myrmeleontidae), beetles (Coleoptera), butterflies, moths and caterpillers (Lepidoptera), cicadas (Cicadidae), flies (Diptera), grasshoppers and their relatives (Orthoptera), mantids (Mantodea), stick-insects (Phasmatodea) and termites (Isoptera), as well as spiders (Araneae) and centipedes (Chilopoda). In one quantified study of the diet of the savanna-dwelling White-crested Helmet-shrike, it was found that caterpillars represented 46% of items, butterflies and moths 19%, grasshoppers 7%, termites also 7%, mantids 5% and small reptiles 1%. Of the material identified in five stomachs, beetles accounted for 42%, ants for 32% and grasshoppers for 12%. The food of the Red-billed Helmet-shrike, a denizen of lowland forest, comprised 50% adult arthropods, 20% larvae and 30% fruit.

Foraging, as with all aspects of helmet-shrike life, is a group activity. The birds obtain most of their animal food by gleaning from vegetation or hawking in flight in the manner of a muscicapid flycatcher. They sometimes employ the technique of hovering, this being practised at least by the smallest species, the Chestnut-





The feathers on the forehead of all helmet-shrikes are stiffened, and in some species project forward over the nostrils, forming a forecrown crest. Similar feathers extend back on the crown, and in some species, especially dark-billed ones like the ***White-crested Helmet-shrike****, they can form a distinctive mid-crown crest. In this species, the mid-crown crest can measure up to 45 mm long in the nominate race; race* concinnatus *has a shorter mid-crown crest, about 25 mm long; and in race* poliocephalus *it is shorter still, and indistinguishable from the forecrown crest.*

[Left: *Prionops plumatus plumatus*,
Gambia.
Photo: Steve Garvie.

Right: *Prionops plumatus poliocephalus*,
KwaZulu-Natal,
South Africa.
Photo: Hugh Chittenden]



One of the features that distinguishes helmet-shrikes from other shrike-like families is their extreme gregariousness. Records of solitary individuals or pairs are unusual. All species live in tightly knit groups which forage, roost, and breed together, within a strict dominance hierarchy, headed by the alpha female. ***Chestnut-fronted Helmet-shrikes*** *live in groups of up to twelve birds during breeding. They may share their home territories with other groups, and when not breeding, they can be found in flocks of up to 30. They also join mixed flocks including other helmet-shrikes.*

[*Prionops scopifrons kirki*, Arabuko-Sokoke Forest Reserve, Kenya. Photo: Steve Garvie]

fronted Helmet-shrike. The forest-dwelling species are the most arboreal in their habits; they tend to forage higher in the trees than their savanna counterparts; and they apparently hawk prey in flight more frequently. The technique of pouncing on prey on the ground seems to be common only for the White-crested Helmet-shrike, which inhabits the most open country and typically forages lower in trees than the other members of the family. It hunts primarily in trees during the summer months, but it obtains more of its food on the ground in the winter. Further, it is attracted to recently burnt ground. One study revealed that this helmet-shrike procured 51 % of its food in trees, 47% from the ground and 2% by aerial hawking. In another study, it took 32% of its prey in trees, 19% on the ground and 49% in flight. In contrast, Retz's Helmet-shrike caught 98% of its prey in trees, 1% on the ground and 1% by hawking in the air. The sighting of a helmet-shrike on the ground is likely to be a very rare to non-existent event for all prionopids with the sole exception of the White-crested Helmet-shrike.

When in the process of foraging, helmet-shrikes frequently tilt the head to one side, suggesting that they sometimes use auditory cues in the locating of prey. They will also hang upside-down in trees the manner of tits (Paridae) while searching for prey.

Helmet-shrikes are regularly associated with avian mixed-species foraging parties, particularly during the non-breeding season. Indeed, it is probable that, in many cases, they act as catalysts in the formation of such parties. Typical co-members of these foraging unions are other insectivores, including woodpeckers (Picidae), woodhoopoes (Phoeniculidae), cuckoo-shrikes, Old World orioles, drongos (Dicruridae), Brubrus, tits and malimbes (*Malimbus*). Sympatric helmet-shrike species often join together to form mixed feeding flocks, either within or separate from multi-species bird parties. The White-crested Helmet-shrike frequently flocks with Retz's Helmet-shrike, and less frequently with Grey-crested, Red-billed and Chestnut-fronted Helmet-shrikes. Similarly, Retz's and Chestnut-fronted Helmet-shrikes commonly associate with one another.

Helmet-shrikes are noisy, garrulous birds, with a wide and varied range of calls. ***Retz's Helmet-shrike*** *has at least 16 different vocalizations, some of which may reflect individual status and gender. Its whistled song is a repeated "tweeoo". Its calls include notes described as chattering, chomping, grating, guttural, rolling, slurred, whistling and, especially, nasal. Calls are often given in group chorus, initiated by the dominant female. Helmet-shrike contact calls include soft, nasal notes, but individuals may give louder, more prolonged notes when they become separated. Loud bill-snapping may be interspersed with vocalizations, and is especially associated with alarm and aggression.*

[*Prionops retzii tricolor*, Liwonde National Park, Malawi. Photo: Johannes Ferdinand]

Breeding

The nesting habits of the majority of helmet-shrikes are extremely poorly documented. The greatest amount of relevant information is available for the widespread White-crested Helmet-shrike, followed by Retz's Helmet-shrike and, to a lesser extent, the Chestnut-fronted Helmet-shrike. The breeding details of the remaining five species are almost or wholly unknown. The evidence that is available does, however, suggest that all members of this family are remarkably similar to one another in their reproductive habits. The White-crested Helmet-shrike serves as the primary model for the discussion that follows

Egg-laying, as with most insectivorous passerines, seems to be timed so that it reaches a peak at the beginning of the rains, although there is frequently no clear single breeding peak discernible close to the equator, where annual bimodal rainfall patterns are typical. In the case of Retz's Helmet-shrike, and probably also its two other savanna relatives the White-crested and Grey-crested Helmet-shrikes, laying is believed to be stimulated by the coming into leaf of the deciduous woodland in which these species breed. Among White-crested and Retz's Helmet-shrikes, at least, multiple brooding is common, both species exhibiting an average of about two nesting cycles per season. Double-brooding is known also for the Red-billed Helmet-shrike. Sometimes, however, these instances could be associated with the breeding by two different females within a group.

Helmet-shrikes are co-operative breeders, and all group-members assist in the tasks of nest construction, incubation of the eggs, brooding and provisioning of the chicks, removal of faecal sacs, and the defence of the eggs and young. The breeding pair, however, apparently shoulders most of the burden. A dominance hierarchy exists within the group, with the breeding female pre-eminent, followed by, in decreasing importance of rank, the breeding male, other adult females, other adult males, adult offspring, immatures and juveniles. The adults other than the breeding pair and their adult offspring are typically siblings of, respectively, the breeding female and the breeding male. The pair-bond between the two breeding adults can last for several years, and is maintained by such activities as perching together, allopreening and duetting. New groups are created when up to four sisters from one group link up with up to four brothers of another group. This means that breeding opportunities usually are not directly inherited in the natal group. On its demise, a dominant breeding bird is replaced by its next-ranking sibling of the same sex. Breeding groups can remain stable for up to ten years. The largest number of helpers, of both sexes, is associated with drier and lower-elevation sites, and with lower latitudes, whereas the absence of helpers and the presence of helpers of only one sex are most prevalent at wetter, higher-elevation sites, and also at higher latitudes.





*The technique of pouncing on prey on the ground seems to be common only in the **White-crested Helmet-shrike**, which inhabits the most open country, and typically forages lower in trees than other members of the family. It is particularly attracted to recently burnt ground for foraging. In winter, it forages primarily in trees, gleaning from the foliage, sometimes hanging upside-down like a tit (Paridae), or hawking flying insects like a flycatcher (Muscicapidae). Forest-dwelling helmet-shrikes are more arboreal in their habits, tending to forage higher in the trees, and apparently hawking prey more frequently. The diet of all helmet-shrikes is mostly adult and larval invertebrates.*

[*Prionops plumatus poliocephalus*, KwaZulu-Natal, South Africa. Photo: Hugh Chittenden]

Courtship by the male is marked by wing-opening and slow wing-flapping, and the male also approaches the female, sometimes with his wings drooped, while carrying nesting material in his bill. The ritual is characteristically simple, slow, silent and deliberate, and is conducted away from the other group-members. The absence of intricate mating displays probably relates to the pre-existing and complex group sociality of helmet-shrikes. Courtship feeding has been reported only for the Chestnut-fronted Helmet-shrike, and even for this species it probably requires confirmation. Interestingly, however, incubating adults of this helmet-shrike have apparently been recorded being fed by other group-members, such behaviour having seemingly not been reported for any other helmet-shrikes.

Nests of helmet-shrikes are exclusively solitary. Two nests of the same species are never built in adjacent trees, and are typically spaced at least 50 m apart, and usually much farther, in the case of the White-crested Helmet-shrike. Some prionopids, however, will nest fairly close to congeners, as illustrated by the finding of simultaneously active nests of White-crested and Retz's Helmet-shrikes less than 80 m apart. A group does not defend its home range and may share it with adjacent groups, the size of the home range tending to increase during the post-breeding period. Helmet-shrikes are territorial only during the breeding season, and all group-members participate in territory defence. In Zimbabwe, 140 home ranges of the White-crested Helmet-shrike varied in size from 4·5 ha to 30 ha, with an average of 18 ha, and 63 territories were 1–12 ha in extent, with an average of 5 ha. In South Africa, one non-breeding home range that was measured by using observations of a group containing a distinctive leucistic member, covered an area of 3·5 km². Markedly larger territory sizes, of about 30 ha and at least 20 ha, have been reported for Retz's and Rufous-bellied Helmet-shrikes, respectively. Territory size of White-crested Helmet-shrikes was found to be associated with rainfall and the density of adjacent groups, among other variables.

The two breeding partners choose the nest-site and undertake most of the work in constructing the nest, but are assisted to a varying degree by other members of the group. The nest tree is sometimes a dominant one within the landscape. Typically, broadleaf trees, such as bloodwood, bridelia (*Bridelia*) matumi (*Breonadia*), miombo, newtonia (*Newtonia*) and *Sarcoglottis* trees, are favoured. The nest is built 2–40 m above the ground, those of the forest-dwelling members of the family probably being located at the highest level. The building work takes at least four days, and the eggs are laid at any time from one day to three weeks later. The nest itself is a remarkably neat and compact cup of bark strips, leaf petioles, grass, tendrils, moss and lichen, extravagantly bound with spider web, which apparently is transported in the bill and on the erectile feathers of the frontal crest, and lined with bark, rootlets, grass and lichen. Camouflaged to resemble swellings on tree branches, helmet-shrike nests have been described as being "wonders of avian architecture". Their dimensions are up to 13 cm in external diameter, with a depth of 3·5–6·5 cm, and 6–8 cm internal diameter, with an interior depth of 1·5–3 cm. They are usually located on a horizontal tree branch or in an upright fork, and often in trees with greyish or lichen-covered bark. The same tree, and even the very same site, may be used in successive years. The White-crested Helmet-shrike will occasionally nest in non-native trees, for example in eucalypt plantations.

The ground colour of helmet-shrike eggs varies from white, pinkish or cream to blue-grey, blue and greenish-blue. The eggs are typically blotched and spotted with shades of purple, grey, blue and brown, the last overlying the first three, and are sometimes scrolled with black; the markings are usually concentrated in a ring at the obtuse end. Their dimensions are in the range 18·5–25·8 × 14·5–18·2 mm. The usual clutch consists of 2–5 eggs, with an average of 3–4, laid at daily intervals, and incubation probably commences only when the clutch is complete. Occasionally, two females within a group will lay in the same nest, resulting in about double the typical clutch size, but some eggs usually fall out of such nests. Repeat clutches are sometimes laid after failure of an earlier breeding attempt. For the White-crested Helmet-shrike, the period between nesting failure and the initiation of a new breeding attempt ranged from six days to 42 days, with an average of eleven days.

Incubation is undertaken by all group-members in the case of the White-crested and Retz's Helmet-shrikes, and members of the breeding pair contribute only about 35% of the work during the daytime. There is some evidence, however, that not all members of Chestnut-fronted Helmet-shrike groups incubate. Change-overs at the nest take place without ceremony. The incubation period spans about 16–21 days, with a mean of 17 days. The adults sit very tight when incubating, even when approached

closely by potential predators. Helmet-shrikes nevertheless are sensitive to disturbance at the nest and are prone to desert during nest-building and the early stages of incubation.

Nestlings of helmet-shrikes are altricial, being naked and blind on hatching. The chicks of Retz's Helmet-shrike, which is parasitized by cuckoos, and those of the Chestnut-fronted Helmet-shrike possess mouth spots. Interestingly, White-crested Helmet-shrike chicks lack such spots, despite some statements to the contrary in the literature. All group-members feed the nestlings, which leave the nest after a period of 17–22 days, the average being 20 days. Fledged young are fed by all members of the group until they are about 10–12 weeks old, by which time they are able to locate food for themselves. The juveniles achieve full independence when about five to seven months of age. They may then disperse and form single-sex flocks, or they may remain in their natal group as helpers.

Nest contents, and group-members themselves, are vulnerable to reptilian, mammalian and avian predators, such as snakes, monkeys, predatory cats, hawks and eagles (Accipitridae), and owls (Strigidae). All of the group will boldly direct aggression at such potential dangers. In addition, some chicks starve to death during seasons when food availability is poor or if other situations, such as weather conditions, are adverse.

Details of breeding success are available for only very few prionopids. For the White-crested Helmet-shrike, 25% of eggs laid produce fledglings, with a range of annual variation of 15–40%, and 30% of nests produce fledglings, the range of annual variation being 20–45%. An average of 0·9 fledglings is achieved per nesting attempt and a mean of 2·9 fledglings per successful nest, the respective ranges of variation being 0·6–1·3 and 2·3–3·2. This species produces 1·7 fledglings per group per year, with an annual variation of 1·4–1·9. Predation, especially during the hatching period, is the main cause of breeding failure of this species. Post-fledging survival, however, is relatively good, and 48–72% of young White-crested Helmet-shrikes survive their first year. Nesting success of Retz's Helmet-shrike is much lower, apparently as a result of cuckoo parasitism. Only 14% of this species' eggs produce fledglings, and just 18% of nests do so, the latter figure reduced from 30% by brood parasitism; productivity is 0·3 fledglings per nesting attempt, 2·0 fledglings per successful nest, and 0·6 fledglings per group per year. As with the White-crested Helmet-shrike, however, post-fledging survival is good, and an average of 79% of fledglings survive their first year, the figure varying annually from 49% to as high as 95%. Helmet-shrike breeding pairs without helpers are typically unsuccessful, but otherwise no clear positive relationship has been established between group size and breeding success.

As already noted, Retz's Helmet-Shrike suffers brood parasitism by cuckoos. The Thick-billed Cuckoo (*Pachycoccyx audeberti*) commonly lays its eggs in the nests of this species, removing both eggs and nestlings of its host. In one study in Zimbabwe, 55% of the helmet-shrike's nests were parasitized. The hosts feed the fledged cuckoo chick when it calls, the cuckoo mimics the begging calls of the host's nestling, but the helmet-shrikes mob the cuckoo when it flies. The breeding success of Retz's Helmet-shrike is poor and no more than half that of other insectivorous birds, and it is much lower than the success achieved by White-crested Helmet-shrikes in the same woodland. This is likely to be related to high levels of cuckoo parasitism. Both the Red-billed and the Rufous-bellied Helmet-shrikes, too, probably act as hosts of the Thick-billed Cuckoo, which occurs widely in West and Central Africa in regions where these two species, but not Retz's Helmet-shrike, occur. It is conceivable that the Gabela Helmet-shrike likewise hosts this cuckoo. Only three, almost certainly accidental, records of brood parasitism are known for the White-crested Helmet-shrike, one by each of the Thick-billed Cuckoo, the Red-chested Cuckoo (*Cuculus solitarius*) and the Black Cuckoo (*Cuculus clamosus*). A high rate of nest attendance by the White-crested Helmet-shrike may reduce opportunities for such parasitism. There are no documented records of brood parasitism being suffered by any of the other helmet-shrike species.

The start of reproductive activity by White-crested Helmet-shrikes is delayed. Although individuals can breed at two years of age, fewer than 50% breed before they are five years old. Similarly, Retz's Helmet-shrike probably can breed at two years, but it is likely that it usually begins later than this. The annual adult survival of both of these species is high, at 83–85%, with a yearly variation of 69–94%.

Movements

Overall, helmet-shrikes are mainly resident. They are not, however, sedentary, and most of the eight species show a marked



Termites feature on the recorded diet of the ***White-crested Helmet-shrike****, among others. All helmet-shrikes forage in groups, which progress in a "leap-frogging" movement through the woodland, the birds at the rear of the group regularly flying to the front. Some individuals act as sentries while the others feed. Parties of White-crested Helmet-shrikes may follow the same foraging path day after day. Outside the breeding season, this species often forms the core of mixed-species flocks that may include other helmet-shrikes, Old World orioles (Oriolidae), drongos (Dicruridae), tits (Paridae) and Brubrus* (Nilaus afer).

[*Prionops plumatus poliocephalus*, Kruger National Park, South Africa. Photo: Jurgen & Christine Sohns/FLPA]

tendency to wander widely away from their nesting territories during the non-breeding period. This post-breeding dispersal is especially apparent in the three most open-country species, namely the White-crested, Grey-crested and Retz's Helmet-shrikes. The general paucity of nutrients and low primary productivity associated with the broadleaf breeding habitats of the White-crested and Retz's Helmet-shrikes are likely to encourage such mobility. It seems that the nature of some of these movements approaches that of true migration, but this is poorly documented.

The White-crested Helmet-shrike apparently makes a regular north–south movement in Ghana and, on the opposite side of its range, another regular movement between Kenyan dry-season non-breeding grounds and Tanzanian nesting areas. Other movements made by this species are apparently altitudinal in nature, the birds regularly descending to lower-lying regions on the completion of breeding. Foraging ranges may be established on the non-breeding grounds, often in areas, such as urban environments, that are wholly unlike the nesting areas. In the case of the Grey-crested Helmet-shrike, regular movement between the Mara–Narok nesting grounds and the Nakuru, Longonot, Naivasha and Menengai Crater areas in the Rift Valley has been suggested, although this poorly known species is considered otherwise largely resident, but with nomadic tendencies. A seasonal east–west movement across its range, with a shift towards the moister east during the drier austral winter, has been claimed for Retz's Helmet-shrike. This, however, requires confirmation, and the species is thought to be mainly resident but with some post-breeding dispersal, especially during drought periods.

The forest-dwelling members of the family seem to be more sedentary, but even for most of these species there is evidence of some local movements. In southern Africa, the Chestnut-fronted Helmet-shrike may wander into adjacent miombo woodland from its forested breeding haunts. The montane and poorly known Yellow-crested Helmet-shrike could be expected to make some altitudinal movements, as evidenced by the unusually high elevation of the locality of the type specimen, at above 4400 m (see Habitat). Similarly, the equally poorly known Gabela Helmet-shrike has been recorded on several occasions below and away from its putative and restricted breeding grounds on the Angolan escarpment. Only the Red-billed and Rufous-bellied Helmet-shrikes, both lowland-forest inhabitants, appear to be entirely sedentary.

Far and away the most remarkable aspect of helmet-shrike movements relates to the large-scale irruptions that affect the White-crested Helmet-shrike, notably in southern Africa. These are associated with major drought periods, when large numbers of the species abandon the woodlands in the north of the region and move south across a broad front into otherwise totally unsuitable habitat, such as the open grasslands of the South African highveld plateau. Such irruptions on to the highveld occurred in 1953, 1970, 1979 and 1992. To the birdwatchers exposed to them, these irruptive events are unforgettable.

Relationship with Man

These engaging and eye-catching birds have found their way into local African folklore in many areas. The Ndebele and Tonga peoples in Zimbabwe believe that, if they encounter a flock of White-crested Helmet-shrikes while out hunting, this signifies good luck and that they will certainly eat meat on that day as a result. A local IsiZulu tribal name for the White-crested Helmet-shrike in south-eastern Africa is *uThimbakazane*, or "the wedding guests", alluding to the noisy, social and apparently festive habits of helmet-shrikes. On perhaps a more sinister note, White-crested Helmet-shrikes have been found in traditional medicine markets in Nigeria.

Overall, however, the members of this family do not feature prominently in human affairs. They are too small to garner significant interest from hunters, and their primarily insectivorous diet means that they pose no threat to crops, orchards or livestock; their effects in this field are likely to positive, if anything. They do not feature in the cagebird trade, although some zoos do hold captive stock. Furthermore, they occur in regions essentially distant from the developed world.

Nevertheless, humans do feature prominently in the fortunes of the helmet-shrikes. This is most worryingly in the form of habitat destruction, which threatens several helmet-shrike species and adversely affects most, if not all, of the members of the family (see Status and Conservation). In a number of regions, the



*More is known about the breeding of the **White-crested Helmet-shrike** than of any other species, but the available evidence suggests that all members of the family are very similar in this respect. Only the dominant pair in a group breeds. The male and female choose the nest-site, which may be used in successive years. They perform most of the construction work, though they are assisted to varying degrees by other members of the group. The nest is a neat, compact cup bound with spiders' web, and camouflaged to look like a swelling on the branch. The 2–5 eggs are laid at daily intervals; occasionally two females may lay in the same nest, resulting in clutches of up to nine eggs. Although non-territorial at other times, helmet-shrikes defend their territory when breeding.*

[*Prionops plumatus poliocephalus*, Modimolle, Limpopo, South Africa. Photo: Warwick Tarboton]





Helmet-shrikes are co-operative breeders, and while the breeding male and female do most of the work, all group-members assist in the tasks of nest construction, incubation, brooding and provisioning of the chicks, removal of faecal sacs, and defence of the eggs and young. The non-breeding females and males tend to be siblings of, respectively, the breeding female and the breeding male, with females dominant over their male counterparts. Breeding pairs without helpers are typically unsuccessful, but the number of helpers seems to have no positive correlation with breeding success. Nesting is timed to coincide with maximum prey availability, often with the onset of the rains, although ***White-crested Helmet-shrikes*** *are believed to be stimulated into laying by the coming into leaf of deciduous trees. Incubation takes 16–21 days, followed by a nestling period of around 20 days. Adults are very tenacious when incubating, sitting tight even when predators approach. However, they are sensitive to disturbance, and are prone to desertion during nest-building and the early stages of incubation. Despite the high level of attendance by group members at the nest, rates of brood parasitism are high in some species. Predation of hatchlings is the main cause of breeding failure in the White-crested Helmet-shrike, and only 25% of its eggs produce fledglings. If an early attempt fails, the birds may lay again, and at least in some regions this species is often double-brooded.*

[*Prionops plumatus poliocephalus*, Eshowe, KwaZulu-Natal, South Africa. Photos: Geoff McIlleron]



*All members of the group assist in feeding the fledglings. In the **White-crested Helmet-shrike** this continues for around ten weeks, after which the young birds start to locate food for themselves. Fledgling survival in this species is much higher than nestling survival, at around 60%. From around five months onwards, the young birds may disperse as single-sex groups. New groups are created when up to four sisters from one group link together with up to four brothers of another group. Other birds may remain as helpers with the natal group. Breeding groups can remain stable for up to ten years, with annual adult survival rates up to 87%. Although they are able to breed from two years old, fewer than half of White-crested Helmet-shrikes do so before they are five years old.*

[*Prionops plumatus plumatus*, Gambia. Photo: Steve Garvie]

White-crested Helmet-shrike appears to benefit to some extent from the drought refuges provided by plantations of alien trees and urban parks and gardens, although probably not enough to offset the damage that its populations suffer from habitat destruction and degradation.

The three species with the most restricted ranges, the Grey-crested, Yellow-crested and Gabela Helmet-shrikes, probably all have a particular value, or at least potential value, as notable ecotourism attractions. Such ecotourism can both benefit impoverished local human communities in the remote regions where these birds occur and also provide additional motivation for the conservation of the natural habitats in which these birds dwell. In this regard, the Yellow-crested and Gabela Helmet-shrikes are both members of large and particularly important communities of locally endemic bird species in the regions that they inhabit, respectively the Albertine Rift mountains and the western Angolan escarpment, further increasing the attractiveness of these areas to ecotourists. The two globally threatened helmet-shrikes (see Status and Conservation) may help by serving as flagship species for the conservation of these unique and scientifically important regions.

Perhaps the greatest value of the helmet-shrikes to humankind generally, however, will come from the scientific insights doubtless to be gleaned from detailed studies of their unusually intense social structure and unique vocalizations, when these long-overdue investigations are tackled in earnest. The Prionopidae, therefore, represent what will certainly be a most fruitful field of research for the serious ornithologist.

Status and Conservation

As a family, the helmet-shrikes face a rather disproportionately high level of threat. Of the eight members of the family, conservation concern has been expressed over the future of no fewer than three species and over that of a fairly distinctive subspecies of a fourth.

The virtually unknown Gabela Helmet-shrike is the most seriously threatened species and is ranked as Endangered. It is a restricted-range species, limited to a part of the Western Angola Endemic Bird Area, and its distribution is estimated at some 4600 km². Its global population is small, numbering about 1000–2500 individuals, is highly fragmented and is decreasing. It is threatened by habitat clearance by subsistence farmers, mainly for charcoal production but also for the growing of bananas, sweet potatoes, coffee, cassava and maize. With the apparent cessation of military conflict in Angola, one can expect human development and associated habitat destruction in this area to be rapid. Encouragingly, however, this species is clearly tolerant of some habitat modification, as it has been recorded in secondary forest and clearings, including coffee plantations in forest. The range of the Gabela Helmet-shrike includes Kissama National Park, which should afford it some protection.



*Helmet-shrikes may often suffer brood parasitism by cuckoos. This can be seen in the photo, where a **Retz's Helmet-shrike** is brooding a Thick-billed Cuckoo* (Pachycoccyx audeberti) *chick. This cuckoo species, in fact, is commonly known to lay its eggs in the nests of Retz's Helmet-shrike, removing both the eggs and the nestlings of its host. In Zimbabwe, one study found that 55% of the helmet-shrike's nests were parasitized. The breeding success of Retz's Helmet-shrike is poor, which is likely to be related to such high levels of cuckoo parasitism.*

[*Prionops retzii*, Stone Hills Game Sanctuary, Zimbabwe. Photo: J. R. Peek]

*The **Grey-crested Helmet-shrike** is a restricted-range species, confined to an area of south-west Kenya and adjacent parts of northern Tanzania, totalling just over 50,000 km². Between 1926 and 1979, it apparently disappeared from the Rift Valley, where it was first described and found breeding in 1884, but it subsequently recolonized the region, where it is now reported to be common. However it is generally scarce, groups having an extremely large home range during the non-breeding season, and it appears to have vanished from parts of its range in Tanzania. Its habitat is being degraded by grazing and cultivation, and because of its continuing population decline it is listed as Near-threatened.*

[*Prionops poliolophus*, Serengeti National Park, Tanzania. Photo: Pete Morris]

Little better in terms of its conservation status, the unusual and inscrutable Yellow-crested Helmet-shrike is ranked as Vulnerable. As with the preceding prionopid, it is a restricted-range species, and its distribution, estimated as covering about 34,000 km², is localized in four regions in the endemic-rich Albertine Rift Mountains Endemic Bird Area. Its population, too, is small, totalling about 2500–10,000 individuals, and is decreasing. This intriguing helmet-shrike is threatened by forest clearance, carried out by subsistence farmers for cultivation of crops, such as maize, and the establishment of cattle pastures, especially at Itombwe and particularly at higher altitudes. These problems are exacerbated by continuing civil unrest and the challenges posed by the presence of large numbers of human refugees. The Yellow-crested Helmet-shrike's range falls largely outside protected areas, but the species does occur in the Virunga National Park.

Another poorly understood member of the family, the Grey-crested Helmet-shrike, is considered globally Near-threatened, as it appears to have a moderately small population apparently undergoing a moderately rapid and ongoing decrease. As with the two aforementioned helmet-shrikes, it is a restricted-range species, but with a distribution encompassing a more comfortable 52,800 km². Part of its range falls within the Serengeti Plains Endemic Bird Area. This species appears to have vanished from the Kigoma and Tabora regions of Tanzania since the early 1900s. Its status in the Rift Valley region of Kenya is enigmatic. It apparently disappeared from this area, where it was first described and found breeding in 1884, during the period 1926–1979, and then recolonized the region, with evidence of breeding at Lake Nakuru in 1989 and subsequently. It is, however, conceivable that, in the intervening period, the species could have been overlooked and/or mistaken for the White-crested Helmet-shrike in the Rift Valley. The Grey-crested Helmet-shrike could be put at risk by habitat destruction and degradation brought about by overgrazing and cultivation. Its range, however, includes parts of the Serengeti, Masai Mara (buffer areas) and Lake Nakuru protected areas.

Although not yet formally considered threatened in any way, the Chestnut-fronted Helmet-shrike is decreasing in numbers and its range is relatively small and highly fragmented. The distribution of this species is concentrated along the vulnerable and heavily exploited East African coastal zone, with its concomitantly high human densities and severe pressure on habitat. It is known to be in decline, in many places dramatically so, along most of its coastal range in Kenya, Tanzania and Mozambique. In Mozambique, it is known to be threatened by the destruction of forest and woodland by logging and for subsistence cultivation. The tiny and peripheral Zimbabwe population, if still extant, must be at serious risk from habitat destruction wreaked by subsistence farmers. The inland Kenyan subspecies *keniensis* is now entirely restricted to the Meru and Ngaia Forests and is rare and endangered; it has disappeared from the Kulal and Marsabit mountains and from Embu District, apparently for unknown reasons largely unrelated to habitat destruction. Current trends strongly suggest that the Chestnut-fronted Helmet-shrike is likely to become threatened in the foreseeable future.



The conservation status of the remaining four members of the family currently seems secure. For example, the White-crested Helmet-shrike is common in suitable habitat over large parts of its extensive range. Nevertheless, each of these four species has certainly lost habitat to a greater or lesser degree to anthropogenic modification. Retz's Helmet-shrike, as an example, is known to be vulnerable to woodland degradation, such as the destruction of miombo woodland in Zimbabwe, and in East Africa it has apparently disappeared from the Nairobi, Kiambu and Ngong regions. Similarly, the Red-billed Helmet-shrike has decreased around major urban centres, such as the Nigerian metropolis of Lagos, although it is present in numerous protected areas, including Taï Forest National Park, in Ivory Coast, Kakum National Park, in Ghana, and Korup National Park, in Cameroon. The Rufous-bellied Helmet-shrike has likewise decreased in some regions. For example, it is now extinct in Rwanda, and in Uganda its numbers have dwindled in Bwamba and Bugoma forests, perhaps to local extinction in the latter. It does, however, occur in numerous protected areas, including the Dzanga-Ndoki National Park, in Central African Republic, and the Odzala and Nouabalé-Ndoki National Parks, in PRCongo.

*The all-black plumaged **Gabela Helmet-shrike** went unrecorded from 1970 to 2003. Previously thought to be confined to higher elevations of remnant escarpment forest in Angola, it has now been found in more widespread open forest near the foot of the escarpment. It occurs in Kishama National Park, but there is currently no information on how effectively this area is being protected. With its tiny range and small and probably declining population of 1000–2500 birds, this species is listed as Endangered.*

[*Prionops gabela*, Bimbe, Angola. Photo: Fabio Olmos]



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Genus *PRIONOPS* Vieillot, 1816

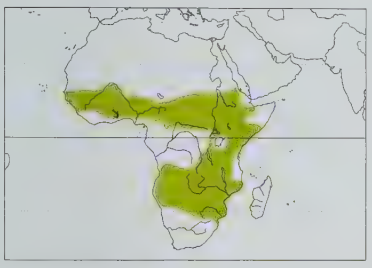
1. White-crested Helmet-shrike

Prionops plumatus

French: Bagadais casqué **German**: Weißschopf-Brillenwürger **Spanish**: Prionopo Crestiblanco **Other common names**: White/Common/Long-crested Helmet-shrike; Straight-crested Helmet-shrike (*plumatus*); Curly-crested Helmet-shrike (*cristatus*); Southern/Smith's Helmet-shrike (*poliocephalus*)

Taxonomy. *Lanius plumatus* Shaw, 1809, Senegal.
Forms a superspecies with *P. poliolophus*, and *P. alberti* possibly part of same group. Other proposed races are *adamauae* (described from Kontcha, in NC Cameroon), synonymized with *concinnatus*; *melanopterus* (from Fer Liban, in SE Ethiopia), synonymized with *vinaceigularis*; and *angolicus* (from Malanje, in N Angola), synonymized with *poliocephalus*. Five subspecies currently recognized.

Subspecies and Distribution.
P. p. plumatus (Shaw, 1809) – Senegal E to N Cameroon.
P. p. concinnatus Sundevall, 1850 – C Cameroon E to C & SW Sudan, NW Ethiopia, NE DRCongo and N Uganda.
P. p. cristatus Rüppell, 1836 – Eritrea, N, W & C Ethiopia, SE Sudan, E Uganda and NW Kenya.
P. p. vinaceigularis Richmond, 1897 – Somalia, E & S Ethiopia, N & E Kenya and NE Tanzania.
P. p. poliocephalus (Stanley, 1814) – S Uganda and C & S Kenya S to SE DRCongo, Angola, Namibia, Botswana and NE South Africa.
Descriptive notes. 19–25 cm; 25–49 g. Nominate race has extensive elongated (up to 45 mm) crest of greyish-white feathers on mid-crown, shorter (c. 10 mm) crest of whitish spiky feathers on forecrown to lores; hindcrown grey, blackish crescent behind white cheek and ear-coverts (feather pigments on head unstable, and easily washed out with soap); neck and underparts whitish, flanks with blackish smudges (at rest, often concealed by wings); upperparts black, glossed greenish; upperwing black, primaries with broad white central bar (conspicuous in flight), outer five secondaries tipped narrowly white, innermost with broad white tip and outer edge, outermost tertial with broad white tip and outer edge, middle tertial with narrow white outer edge, inner greater and median upperwing-coverts white (white in secondaries, tertials and coverts shows as obvious bar in folded wing); outer tail feathers completely white, inner tail feathers glossy black with white tips, white decreasing in extent towards central two rectrices, which completely black; underwing-coverts and axillaries black;



iris dark greenish-grey with yellow outer ring, conspicuous broad orange-yellow orbital ring with scalloped fringe; bill blackish; legs and feet pinkish-orange to red. Sexes similar. Juvenile has shorter crest on mid-crown, no dark crescent behind face, plumage tinged browner, with buff feather tips on upperparts, eyes brown, no orbital ring, legs and feet yellower; adult appearance acquired at c. 12 months. Other races have iris bright yellow; race *concinnatus* has shorter, forward-curving mid-crown crest (c. 25 mm) and narrower wingbar than nominate; *cristatus* also has short, forward-curving mid-crown crest, lacks white in secondaries, tertials and upperwing-coverts, has central tail feathers tipped white; *vinaceigularis* lacks white wingbar, has mid-crown crest even shorter (c. 15 mm) and not distinct from forecrown crest; *poliocephalus* is small, has white wingbar as broad as nominate but mid-crown feathers as short as preceding race, entire crest from lores to mid-crown uniformly greyish, head greyer than nominate and with darker crescent behind eye, whiter tail. Voice. Noisy, vocalizations important in regulating intra-group social interactions; at least some calls may reflect individual social status. Wide variety of calls (at least 20 documented), many of which striking and protracted, including buzzing, chanting, chattering (on locating food or nest material), chipping, churring, clicking, gobbling, growling (during aggression), rolling, scolding, slurred, twittering, whistling, winding and, especially, nasal notes. Loud bill-snapping also characteristic, especially when provoked. Many calls given in group chorus and duets, including during territorial display, often initiated by dominant female. Breeding male and female maintain pair-bond through duetting, male giving "yuki-yuki" call, female responding with "kidoki-doki". Main call distinctive "cherow-cherow"; soft flight contact call "whit-whit", and louder "treeu" by lost individuals; alarm call shrill "tzzee-tzzee". Vocalizations apparently vary among subspecies, e.g. in E Africa reportedly between *poliocephalus* and *cristatus*.

Habitat. Breeds mainly in deciduous broadleaf savanna woodlands, including those dominated by *Baikiaea*, *Brachystegia*, *Burkea*, *Colophospermum*, *Combretum*, *Pterocarpus* and *Terminalia*. In non-breeding season, wanders widely to acacia savanna and other woodlands, coastal and riparian forest and forest edge, lightly wooded grassland, and oil-palm (*Elaeis guineensis*), eucalypt (*Eucalyptus*) and pine (*Pinus*) plantations; also visits gardens, even urban areas. Attracted to recently burnt ground for foraging. To 2200 m; usually below 1500 m, and rare above 1800 m.

Food and Feeding. Diet small invertebrates, also small reptiles, and fruit. Among invertebrates, caterpillars account for 46% of items, butterflies and moths (Lepidoptera) 19%, grasshoppers (Acrididae) 7%, termites (Isoptera) 7%, praying mantises (Mantidae) 5%, with ants (Formicidae), beetles (Coleoptera), centipedes (Chilopoda), cicadas (Cicadidae), flies (Diptera) and spiders (Araneae) also represented; small reptiles, mainly geckos (Gekkonidae), form 1% of recorded prey. Identified material in five stomachs contained 42% beetles, 32% ants and 12% grasshoppers. May use auditory cues in prey location. Hunts at all levels, mainly in middle to lower vegetation layers among leaves, branches and twigs, and on ground. In summer hunts primarily in trees, in winter more on ground. In study in Zimbabwe, prey taken on ground and arboreally (from bushes, leaves, trunks, branches and twigs) apparently in approximately equal proportions but only rarely in flight; in another study, 41% of prey taken from twigs and stems, and 32% while perched, 49% in flight and 19% on ground. Sometimes hangs upside-down in manner of a tit (Paridae) while foraging, and also hawks flying insects in air in manner of a flycatcher (Muscicapidae). Lives and forages in tightly knit groups of 2–22 (average seven) individuals in undefended home range, which may be shared with adjacent groups, home-range size tending to increase during post-breeding period; groups smallest during breeding season, at least in S of range. Progresses in "leap-frogging" movement through woodland, birds at rear of group regularly flying to front; may trace identical foraging path day after day, and some individuals act as sentries while others forage. Especially in non-breeding season, joins mixed-species bird parties with *P. retzii*, towards which sometimes markedly aggressive, and, far less frequently, *P. scopifrons*, *P. caniceps* and *P. poliolophus*, as well as other birds, e.g. Old World orioles (Oriolidae), drongos (*Dicrurus*), tits and Brubrus (*Nilaus afer*), and likely catalytic in formation of these parties.

Breeding. Egg-laying virtually throughout year, especially Mar–Nov (mainly Mar–Jul and Oct–Nov), in W Africa, mainly Feb–Jun in NE Africa, Feb–Nov (mainly Feb–Mar and Oct–Nov) in E Africa, and mainly Aug–Apr (peak Sept–Nov) in C & S of range; often double-brooded, and in Zimbabwe, average of two (annual range 1·5–2·6) nesting attempts per season. Monogamous, pair-bond can last 2–3 years. Co-operative breeder, all group-members assisting in all aspects of nesting duties, breeding pair apparently doing most, intra-group hierarchy (in descending order of dominance) breeding female, breeding male, other adult females (typically siblings of breeding female), other adult males (typically siblings of breeding male), adult offspring, immatures and juveniles; breeding group stable for up to ten years, dominant breeding bird replaced on demise by next-ranking sibling of same sex; new group created when up to four sisters from one group join with up to four brothers of another group; some pairs without helpers, these are normally unsuccessful. Nest solitary, inter-nest distance typically at least 50 m, usually much greater; territorial during breeding, all group-members participate in territory defence, 63 territories in Zimbabwe 1–12 ha, average 5 ha. Courtship marked by wing-opening and slow wing-flapping, and male with nesting material in bill approaching female. Breeding pair chooses nest-site and does most of construction work, but assisted by other group-members, nest-building taking at least four days; nest a neat, compact cup of bark strips extravagantly bound with *Microstigma* spider web (web apparently transported in bill and on erectile frontal crest feathers), lined with bark, rootlets, grass and lichen, camouflaged to resemble swelling on branch, external diameter 8·1–9 cm, depth 3·5–6·5 cm, internal diameter 6·3–7·1 cm, depth 2·4–2·8 cm; placed 2–10 m (mainly 3–6 m) above ground on horizontal tree branch or in upright fork, often in tree with greyish or lichen-covered bark, sometimes in eucalypt plantation; has nested less than 80 m from *P. retzii*; same tree, even same site, may be used in successive years. Clutch 2–5 eggs, average 3·9 in Zimbabwe, occasionally two females lay in same nest (then up to 9 eggs in nest), eggs laid at daily intervals; replacement laid if clutch lost, in Zimbabwe average 11 days between nesting failure and new attempt; incubation by all group-members, breeding pair doing only c. 35% of it during daytime, incubation period 16–21 days, typically 17 days; chicks brooded and fed by all of group, nestling period 17–22 days, generally c. 20 days; fledged young fed by group-members until c. 10 weeks old, when able to locate food for themselves; from c. 5 months juveniles disperse from groups and form single-sex flocks with others, or remain in natal group as helpers. Three records of brood parasitism, one each by Thick-billed (*Pachycoccyx audeberti*), Red-chested (*Cuculus solitarius*) and Black Cuckoos (*Cuculus clamosus*); high rate of nest attendance may reduce opportunities for brood parasitism. In Zimbabwe, average of 25% of eggs and 30% of nests produce fledglings, 0·9 fledglings per nesting attempt, 2·9 fledglings per successful nest, and mean productivity 1·7 fledglings per group per year; average of 60% of fledglings survive first year; main cause of failure is predation by mammals, reptiles, and other birds e.g. Bateleur (*Terathopius ecaudatus*), Ayres's Hawk-eagle (*Hieraaetus ayresii*), African Harrier-hawk (*Polyboroides typus*), Gabar Goshawk (*Micronisus gabar*) and Peregrine Falcon (*Falco peregrinus*); some chicks starve to death. Can breed at two years, but fewer than 50% breed before five years old. In Zimbabwe, annual survival of adults 76–87%.

Movements. Largely resident, but with widespread seasonal movement out of breeding home range, including apparent migrations, e.g. N–S seasonal movement in Ghana, and regular migration (by race *poliocephalus*) between Kenyan dry season non-breeding grounds and Tanzanian nesting areas. Some movements apparently altitudinal, with descent to lower-lying regions in non-breeding season. In S of range apparently particularly nomadic in dry season, wandering to wooded regions not suitable for breeding and even into urban habitats, e.g. Bulawayo (Zimbabwe). Establishes foraging home ranges on non-breeding grounds and uses traditional roost-sites in leafy trees, e.g. *Acacia*, *Lonchocarpus* and *Thespia*. Also prone to large-scale irruptions associated with major drought periods, e.g. S Africa in 1953, 1970, 1979 and 1992, when large numbers move through and into otherwise unsuitable habitat, e.g highland grasslands to S of main range.

Status and Conservation. Not globally threatened. Frequent to common over large parts of range. Density of up to 1 group/10 ha in far S of range. In Zimbabwe, 140 home ranges 4·5–30 ha, average 18 ha, size associated with variables such as rainfall and density of adjacent groups; one non-breeding home range in South Africa 3·5 km². Occurs in numerous national parks and other protected areas throughout its range. May have benefited from drought refuges provided by plantations and urban parks and gardens.

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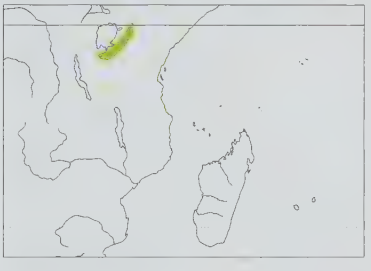
2. Grey-crested Helmet-shrike

Prionops poliolophus

French: Bagadais à huppe grise **Spanish**: Prionopo Crestigrís
German: Grauschopf-Brillenwürger

Taxonomy. *Prionops poliolopha* G. A. Fischer and Reichenow, 1884, Lake Naivasha, Kenya. Forms superspecies with *P. plumatus*, and *P. alberti* possibly part of same group. Monotypic.

Distribution. SW Kenya and adjacent N Tanzania.



Descriptive notes. 23–26 cm; one male 49 g. Has long (c. 20 mm) bushy crest of grey to dark grey feathers on mid-crown, shorter crest of whitish-tipped grey spiky feathers on forecrown to lores, dark grey hindcrown and nape, blackish crescent behind grey cheek and ear-coverts; chin and throat grey, flanks greyish, neck and remainder of underparts whitish, blackish patch at side of chest; upperparts black, glossed greenish; upperwing black, primaries with broad white central bar (conspicuous in flight), innermost primaries tipped white, outer five secondaries tipped broadly white and innermost with broad white tip and outer edge, outermost tertial with broad white tip and outer edge, middle tertial with narrow white outer edge, inner greater and median upperwing-coverts white (white in secondaries, tertials and coverts shows as obvious bar in folded wing); outer tail feathers almost completely white, remainder black with white tips, white decreasing in extent towards central two rectrices; underwing-coverts and axillaries black; iris bright yellow, orange outer ring; bill blackish; legs and feet orange-red to pink-red. Distinguished from *P. plumatus* mainly by larger size, darker grey head, blackish patch at side of chest and absence of orbital ring. Sexes similar. Juvenile not described in detail, has eyes dark and crest shorter and straighter than adult's. Voice. Poorly documented. Vocalizations include chattering, churring, descending, harsh, rolling and scratchy notes; deeper and more guttural than voice of *P. plumatus*. Bill-snapping characteristic, as is group chorusing.

Habitat. Open savanna dominated by *Acacia dephanolobium* and *Tarchonanthus*, and riparian forest characterized by *Acacia xanthophloea*, *Acacia abyssinica* and *Protea*, as well as lightly wooded grassland and scrub; 1200–2200 m. Usually in better-developed, higher-rainfall woodland than that occupied by *P. plumatus*, which it replaces locally at higher altitude.

Food and Feeding. Little known. No details of adult diet; likely mainly insects. Nestling diet at L Naivasha (Kenya) mostly insect larvae, grasshoppers (Orthoptera) and praying mantis (Mantidae). Lives and forages in tightly knit groups of 4–9 (typically about seven) individuals, rarely up to 17. Perches in low bushes. Sometimes joins mixed-species parties, locally (Loliondo region, in Tanzania) including those with *P. plumatus*.

Breeding. Poorly known. Egg-laying reported as Apr–May, but nest-building recorded Sept–Nov and incubation in Oct and Dec in L Naivasha area (Kenya). Co-operative breeder, in groups of up to twelve individuals, sometimes more; all group-members assist in nesting activities. In study of twelve groups around L Naivasha during Sept 2003 to Mar 2004, 16 nests (built by eight groups) were found; following details based on results of this study. Nest built by all group-members, an open cup of grass c. 3·5–5 cm in diameter and 1·4 cm in depth, coarser material (such as bark) used for framework, lined with finer materials (spider web), outer wall entirely covered with spider web, and structure bound to branch with cobweb, placed either 3–5 m above ground in *Tarconanthus camphoratus* bushland or higher, up to 18–20 m, in *Acacia xanthophloea* woodland (height varied with habitat and site). Clutch 3–4 eggs, occasionally up to 7 (very likely result of two females laying in same nest), typically laid at intervals of 1–2 days; up to four replacements, always in new nest some distance away from original tree, if breeding attempt failed; incubation of eggs and brooding and feeding of chicks by all members of group, including juveniles, at four nests incubation period 16–18 days and nestling period 22–24 days. Of 16 nests found, one was disturbed

On following pages: 3. Yellow-crested Helmet-shrike (*Prionops alberti*); 4. Red-billed Helmet-shrike (*Prionops caniceps*); 5. Rufous-bellied Helmet-shrike (*Prionops rufiventris*); 6. Retz's Helmet-shrike (*Prionops retzii*); 7. Gabela Helmet-shrike (*Prionops gabela*); 8. Chestnut-fronted Helmet-shrike (*Prionops scopifrons*).

before eggs laid, eight preyed on during incubation, two lost some eggs but incubation continued until rest hatched but both then preyed on, one other suffered predation at nestling stage, and only four (25%) produced fledged young.
Movements. Apparently largely resident; some post-breeding movement likely from Mara–Narok nesting grounds NE in Rift Valley to L Nakuru, Longonot, Naivasha and Menengai Crater areas during Oct–Feb.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Serengeti Plains EBA. Has rather small range of c. 52,800 km², within which moderately small population believed to be undergoing moderately rapid decrease. Occurs from lakes Nakuru, Elmenteita and Naivasha, and Kedong valley through Narok District, Masai Mara and Sabaringo valley to Loita and Nguruman Hills, Loliondo and Serengeti; also Mwanza; main concentration Narok to Serengeti. Present in Kigoma and Tabora regions in early 1900s, but no subsequent records. Apparently disappeared from Rift Valley region (where first described and found breeding in 1884) during 1926–79, although conceivably overlooked; subsequently recolonized region, with evidence of breeding at L Nakuru in 1989 and later, e.g. at L Oloidien (Naivasha area). Generally scarce, e.g. Masai Mara, groups having extremely large home range during non-breeding season; common in some areas, e.g. extreme N Serengeti and Rift Valley. Potentially threatened by habitat destruction and degradation through overgrazing and cultivation. Range includes parts of Serengeti National Park, the buffer areas of Masai Mara National Park, and Lake Nakuru National Park.
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3. Yellow-crested Helmet-shrike

Prionops alberti

French: Bagadais d'Albert **Spanish**: Prionopo Crestigualdo
German: Gelbschopf-Brillenwürger

Taxonomy. *Prionops alberti* Schouteden, 1933, summit of Mount Mikeno, 4467 m, Kivu District, DRCongo.
Possibly part of the superspecies formed by *P. plumatus* and *P. poliolophus*. Monotypic.
Distribution. Mountains of W Albertine Rift in E DRCongo.



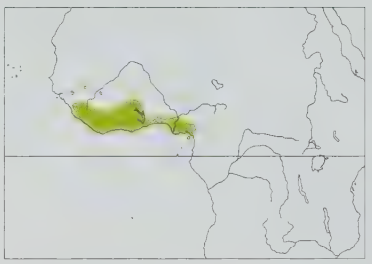
Descriptive notes. 22–24 cm; 61–62 g. Has rounded yellow crest (up to 20 mm) from lores to hindcrown, yellow extending down to level with eye (yellow crest feathers not always obvious in field, and can be fringed brown or grey); remainder of plumage black, glossed greenish; reported as sometimes showing white or grey bar across inner primaries; iris greenish-yellow, narrow orange orbital ring; bill black; legs flesh-coloured to reddish. Sexes similar. Juvenile has whitish, brownish or pale yellow crest, duller, less glossy, body plumage, brown eyes, brownish bill. Voice. Poorly known. Typical call described as "tlu-uk" note, repeateed up to six times, musical and far-carrying. Also noisy chorusing and duetting, and bubbling, chattering, descending, nasal, piping, rolling and slurred notes.
Habitat. Montane forest, *Hagenia* and bamboo forest, also, at lower altitudes, primary rainforest; 1100–2600 m, primarily 1400–2500 m, but apparently first discovered at c. 4400 m in alpine zone.
Food and Feeding. Diet apparently insects, e.g. grasshoppers (Orthoptera). Lives and forages in tightly knit groups mostly of 4–8 individuals (up to 20 recorded), which move at speed. Concentrates hunting in upper canopy, and frequently catches insects in flight in manner of flycatcher (Muscicapidae). Sometimes perches in open. Occasionally in mixed-species bird parties.
Breeding. Poorly known. Egg-laying apparently during rains, recorded Dec–Apr and Jun–Jul. Co-operative breeder. Nest reported as built with twigs and lichen, lined with rootlets, placed 6–7 m above ground (about half-way up) in fork of tree in montane forest. No other information.
Movements. No details. Probably resident, perhaps with some seasonal altitudinal movements.
Status and Conservation. VULNERABLE. Restricted-range species: present in Albertine Rift Mountains EBA. Generally rare to uncommon. Global population likely to be small, estimated as in range c. 2500–10,000 and decreasing. Present at four localized regions in Albertine Rift: Itombwe Mts (Mwana to Kitongo and Kilize), mountains W of L Edward (Bitakongo, Kanyabisika and Pinga to Bilati) and L Kivu (Kamatemba, Virunga to Butokolo) and, at 1770–2474 m, Mt Misotshi-Kabogo (formerly Mt Kabobo) and Muganja Hills. No longer present at type locality. Report of presence in Bwindi-Impenetrable Forest, in SW Uganda, requires confirmation; claimed Rwandan record unacceptable. During surveys in S & C Itombwe in 1996, was observed many times W of the C plateau, but apparently absent in similar habitat to E. Threatened by forest clearance for subsistence cultivation, e.g. maize, and cattle pastures, especially at Itombwe (particularly at higher altitudes). Problems exacerbated by civil unrest among human population and military activity, with large numbers of refugees. This species' geographical range is largely outside protected areas, but it occurs in Virunga National Park.
Bibliography. Anon. (2008d), Butchart & Stattersfield (2004), Chapin (1954), Fry *et al.* (2000), Hall & Moreau (1970), Harris & Franklin (2000), Hendrickx (1946), Omari *et al.* (1999), Plumptre, Behangana *et al.* (2003), Plumptre, Kujirakwinja *et al.* (2007), Prigogine (1949, 1953a, 1971, 1985), Schouteden (1933, 1935), Stattersfield & Capper (2000).

4. Red-billed Helmet-shrike

Prionops caniceps

French: Bagadais à bec rouge **German**: Rostbauch-Brillenwürger **Spanish**: Prionopo Piquirrojo
Other common names: Red-billed Shrike, Chestnut-bellied/Western Helmet-shrike

Taxonomy. *Sigmodus caniceps* Bonaparte, 1850, West Africa = Boutry (Butré) River, Ghana.
Forms a superspecies, and often considered conspecific, with *P. rufiventris*. Two subspecies currently recognized.
Subspecies and Distribution.
P. c. caniceps (Bonaparte, 1850) – SW Mali (including Mandingues Mts), Guinea and Sierra Leone E to Ghana and S Togo.
P. c. harterti (Neumann, 1908) – Benin, Nigeria and W Cameroon.



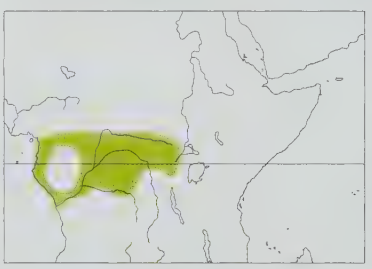
Descriptive notes. 20–22 cm; 42–62 g. Nominate race has crown down to eye level and lores blue-grey, rest of head and neck, including chin and throat, black; upperparts black, glossed greenish; flight-feathers black, primaries with broad white central bar (conspicuous in flight), uppertail black and glossy; breast and upper belly white, well demarcated from buff lower underparts; underwing-coverts and axillaries dark grey; iris yellow, narrow orange-red orbital ring; bill red; legs orange-red. Sexes similar. Juvenile is browner than adult and more streaked in appearance, lacks blue-grey crown, has dark line through lores, orbital ring inconspicuous, eyes brown, bill blackish (later yellow), legs duller. Race *harterti* has blue-grey of crown extending below eye on to cheek and upper ear-coverts, and paler buff on belly resulting in less clear differentiation from white chest. Voice. Highly vocal. Commonest call (probably contact) of nominate race "wrrraak, wrraak", described as fairly soft and "dry and leathery"; other, more penetrating harsh and grating contact calls rather corvid-like. Song comprises loud whistling, either rising in pitch in middle of song or descending in pitch overall. Duetting recorded. Most characteristic call of race *harterti* on Mt Kupé (Cameroon) "kui-kui, kui-kui", similar to that of *P. rufiventris*. Aggressive chattering call directed at monkeys and accompanied by bill-snapping. Wingbeats noisy.
Habitat. Lowland primary and gallery forest, also mature secondary forest, dense riverine vegetation, forest edge, logged forest and farmland, and old coffee plantations; lowlands, to 700 m in Guinea.
Food and Feeding. Diet insects, e.g. beetles (Coleoptera), caterpillars, cicadas (Cicadidae), grasshoppers (Orthoptera), praying mantises (Mantidae) and stick-insects (Phasmatodea), as well as spiders (Araneae), fruits and seeds. Food in Ivory Coast 50% adult arthropods, 20% larvae and 30% fruit. Hunts mainly in middle forest layer, 10–20 m up, less frequently in canopy. Apparently more sluggish than woodland members of family. Catches most prey in flight in manner of flycatcher (Muscicapidae); also gleans insects from leaves and twigs, but avoids thicker trunks. Lives and forages in groups of usually 4–8 individuals (up to 20 recorded); group-members remain within 1–4·5 m of one another when foraging. Joins mixed-species foraging parties, especially during non-breeding season, with *P. plumatus* and other birds, e.g. cuckoo-shrikes (Campephagidae), drongos (*Dicrurus*) and malimbes (*Malimbus*), but keeps to rear of party.
Breeding. Poorly known. Egg-laying apparently mainly Dec–Feb, also Jul; reported as double-brooded. Likely co-operative breeder, e.g. five individuals seen at one nest. One nest described as a compact, greyish-green cup, that appeared too small for incubating bird, placed 15 m up in subcanopy fork in secondary forest, another 40 m up in *Sarcoglottis* tree. Possibly parasitized by Thick-billed Cuckoo (*Pachycoccyx audeberti*). No other information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Frequent to common across large parts of range. Apparently decreased around major urban centres, e.g. Lagos (Nigeria). Present in several protected areas, e.g. Taï Forest National Park, in Ivory Coast, Kakum National Park, in Ghana, and Korup National Park, in Cameroon.
Bibliography. Balchin (1988), Bannerman (1939a), Borrow & Demey (2001), Fry *et al.* (2000), Gatter (1997), Greig-Smith (1976), Hall & Moreau (1970), Harris & Franklin (2000), Hart (1971), Rodewald *et al.* (1994), Thiollay (1973).

5. Rufous-bellied Helmet-shrike

Prionops rufiventris

French: Bagadais à ventre roux **German**: Gabunbrillenwürger **Spanish**: Prionopo Ventrirrojo
Other common names: Gabon/Gaboon/Chestnut-breasted Helmet-shrike

Taxonomy. *Sigmodus rufiventris* Bonaparte, 1853, Mozambique; error = Gabon.
Forms a superspecies, and often considered conspecific, with *P. caniceps*. Two subspecies recognized.
Subspecies and Distribution.
P. r. rufiventris (Bonaparte, 1853) – S Cameroon E to Central African Republic and NW DRCongo, S to Equatorial Guinea, Gabon, PRCongo and N Angola (Cabinda).
P. r. mentalis (Sharpe, 1884) – C & NE DRCongo and W Uganda.



Descriptive notes. 20–22 cm; 37–63 g. Nominate race has most of head from crown and nape down to ear-coverts, cheek and chin blue-grey, whiter on forehead, lores and around eye, lower throat and neck black; upperparts black, glossed greenish; flight-feathers black, primaries with broad white central bar (conspicuous in flight), uppertail black and glossy; breast white, sharply differentiated from rufous lower chest and belly; underwing-coverts and axillaries blackish; iris yellow, narrow orange-red orbital ring; bill red; legs orange-red. Sexes similar. Juvenile is browner than adult, more streaked in appearance, lacks blue-grey crown, has dark line through lores, orbital ring inconspicuous, eyes brown, bill blackish (later yellow), legs duller. Race *mentalis* is smaller than nominate, with narrower black collar, narrower white breastband, latter with blue-grey along upper edge, darker rufous on lower chest and belly, and paler orbital ring. Voice. Highly vocal. Song lengthy and constant fluid "tyooyoo". Common call a harsh and strident "chaja" and variations thereof, repeated; other calls comprise hoarse and whistling notes, sometimes combined, and other clicking, nasal and slurred sounds. Duetting recorded. Some vocalizations, e.g. "kyop-kyop, kyop-kyop" double note, very similar to those of *P. caniceps*. Bill-snapping common, and wingbeats noisy.
Habitat. Primary forest, including both open-canopy and closed-canopy forest and forest on slopes; also mature secondary forest and forest edge. Mostly lowlands, to 1450 m in DRCongo.
Food and Feeding. Diet insects, e.g. beetles (Coleoptera), butterflies and moths (Lepidoptera), caterpillars, cicadas (Cicadidae), grasshoppers (Orthoptera), praying mantises (Mantidae) and stick-insects (Phasmatodea), as well as spiders (Araneae); also seeds and fruits, e.g. of *Musanga* and *Croton*. Hunts just beneath or inside canopy; hops along branches, and searches among leaves and lianas while in flight. Lives and forages in groups of usually 4–8 individuals (up to twelve recorded). Often in mixed-species bird parties, especially in non-breeding season; probably a catalyst species of such flocks.

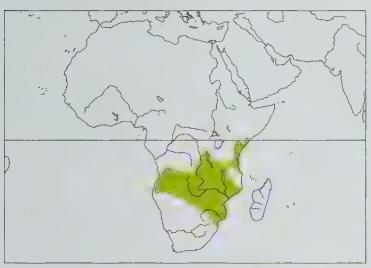
Breeding. Poorly known. Egg-laying apparently May–Jul and Nov–Dec. Likely co-operative breeder. Territorial, and all group-members participate in territory defence; territory large, e.g. at least 20 ha. Fledglings fed by all group-members. Possibly parasitized by Thick-billed Cuckoo (*Pachycoccyx audeberti*). No other information.
Movements. Apparently sedentary.
Status and Conservation. Not globally threatened. Frequent to common across large parts of range. Formerly occurred in Rwanda, but now extinct there. Seems to have decreased in Bwamba and Bugoma forests in Uganda, and possibly extinct in latter. Present in numerous protected areas, e.g. Dzanga-Ndoki National Park, in Central African Republic, and Odzala and Nouabalé-Ndoki National Parks, in PRCongo.
Bibliography. Borrow & Demey (2001), Brosset & Érard (1986), Carswell *et al.* (2005), Chapin (1921, 1954), Christy & Clark (1994), Dowsett (1993), Fry *et al.* (2000), Harris & Franklin (2000), Prigogine (1971), van Someren & van Someren (1949).

6. Retz's Helmet-shrike

Prionops retzii

French: Bagadais de Retz **German**: Dreifarben-Brillenwürger **Spanish**: Prionopo de Retz
Other common names: Red-billed(!)/Black Helmet-shrike, Retz's Shrike, Retz's Red-billed Shrike/Helmet-shrike

Taxonomy. *Prionops retzii* Wahlberg, 1856, "ad flumen Doughe" = Okavango River, southern Africa.
Forms a superspecies, and conceivably conspecific, with *P. gabela*. Other proposed races are *intermedius* (described from Mwanza, S of L Victoria, in Tanzania), synonymized with *tricolor*, and *neumanni* (from Fanole, in Somalia), synonymized with *graculinus*. Four subspecies recognized.
Subspecies and Distribution.
P. r. nigricans (Neumann, 1899) – Angola (except N & extreme S), NW Zambia and SE DRCongo.
P. r. graculinus Cabanis, 1868 – S Somalia, Kenya and NE Tanzania.
P. r. retzii Wahlberg, 1856 – extreme S Angola (S Huila and probably Cubango) and S Zambia S to N Namibia, N & E Botswana, Zimbabwe and N South Africa.
P. r. tricolor G. R. Gray, 1864 – W & S Tanzania and S & E Zambia S to Malawi, Mozambique, NE South Africa and E Swaziland.



Descriptive notes. 19–24 cm; 33–61 g. Nominate race has head, neck, upper mantle and underside from chin to belly glossy black, including slight crest on forecrown to lores; lower mantle and scapulars to rump, including inner upperwing-coverts, grey-brown, long black uppertail-coverts; remiges and outer primary coverts black, primaries with broad white central bar (conspicuous in flight), tail glossy black, broad white tips on outer rectrices, white decreasing in extent on inner tail feathers towards central pair, which is completely black; lower belly to undertail-coverts white, underwing-coverts and axillaries grey-brown; iris yellow, conspicuous broad orange-red to red orbital ring with scalloped fringe; bill red, tip orange-yellow; legs orange-red. Sexes similar. Juvenile is largely grey-brown above and below, with buff feather tips on upperparts, wing feathers often with narrow white tips, no orbital ring, eyes brown, bill blackish (later yellow), legs blackish (later yellow); juvenile plumage apparently followed by similar intermediate immature plumage, and full adult dress possibly acquired only after 24 months, but confirmation required. Race *nigricans* has upperparts darker grey, with less contrast between head to upper mantle and rest of upperparts; *tricolor* is slightly smaller, with upperparts lighter grey-brown, lower belly whiter, central two tail feathers sometimes have narrow white tips; *graculinus* is like previous but even smaller, with fairly pronounced crest (up to 20 mm) on forehead and forecrown, upperparts even paler and browner, wingbar reduced or absent, and central two tail feathers tipped white. Voice. Highly vocal; at least 16 different vocalizations identified, and some calls may reflect individual social status or gender. Louder and more musical than *P. plumatus*. Whistled song a repeated "tweeoo", similar to that of Old World orioles (Oriolidae), also as "cheeeow, cheeee-owp". Typically, calls comprise chattering, chomping, grating, guttural, rolling, slurred, whistling, winding and, especially, nasal notes, often given in tandem, can be ascending or descending, and sometimes alternating; some calls likened to those of nightjars (Caprimulgidae) and barbets (Capitonidae). Calls often given in group chorus, and duetting common and believed important in pair-bond maintenance; dominant female apparently initiates much of calling. Contact calls "chuk", "wik-horr", "chewherrrr" and "chullit"; "chucker" call associated with location of prized food, and growling with aggression at roost; alarm calls sharp squealing, screaming and churring notes. Breeding male directs soft chick-like soliciting call at breeding female. Bill-snapping also characteristic.
Habitat. Well-developed, moist deciduous broadleaf woodland, including *Baikiaea*, *Brachystegia*, *Colophospermum* (the last only when particularly tall and profuse) and, especially in drier areas, riverine woodland; also lowland forest and juniper (*Juniperus*) forest. When non-breeding, wanders to isolated thickets and scrub, drier tall savanna and mixed acacia (*Acacia*) woodland, forest, plantations and mangroves. Prefers damper woodland than that occupied by *P. plumatus*. Usually below 1500 m, but occasionally to 1900 m.
Food and Feeding. Diet mainly insects, e.g. beetles (Coleoptera), butterflies and moths (Lepidoptera), caterpillars and other larvae, cicadas (Cicadidae), grasshoppers (Orthoptera), praying mantises (Mantidae), termites (Isoptera); also spiders (Araneae) and small reptiles, e.g. geckos (Gekkonidae) and other lizards. Hunts among branches, twigs and leaves in upper vegetation levels, typically higher than levels preferred by *P. plumatus*. At times hangs upside-down in manner of tits (Paridae), and seems also to utilize auditory cues in prey location. Sometimes catches prey on ground, also in flight in manner of muscicapid flycatcher. In study in Zimbabwe, 48% of hunting on branches, 25% on trunks, 22% on twigs, 2% on leaves, 1% in bushes, 1% on ground and 1% aerially. Apparently more arboreal and more mobile than *P. plumatus*. Lives and forages in tightly knit groups of usually 2–15 individuals (4·7), sometimes more, up to 30 recorded. In winter period, joins mixed-species parties with *P. plumatus* and *P. scopifrons*, as well as other birds, e.g. Old World orioles (Oriolidae), drongos (*Dicrurus*), tits and woodpeckers (Picidae), and may be a catalyst species in formation of these parties.
Breeding. Egg-laying mainly Jan–Mar and Sept in E Africa and Aug–Mar (peak Sept–Oct) in C & S Africa, nesting believed stimulated by trees coming into leaf; sometimes double-brooded, and in Zimbabwe mean of 1·9 nesting attempts per season (sometimes conceivably associated with group splitting, with two breeding females). Monogamous; pair-bond maintained by allopreening and duetting. Co-operative breeder, all group-members assisting in nest-building and all other aspects of nesting duties (breeding group typically slightly smaller than non-breeding ones), likely intra-group dominance hierarchy, with breeding female at top, followed by breeding male, and then other group adults and offspring (subordinate males and females likely respective siblings of dominant pair); rarely, breeding pair nests alone. Nest solitary, in large territory of c. 30 ha. Courtship marked by slow wing-flapping, and male with nesting material in bill and wings drooped approaching female. Nest, one of which took seven days to build, a shallow cup of lichen, leaf petioles, grass, tendrils and thin bark, bound with spider web (web transported in bill and on erectile frontal crest feathers), lined with fine grass and bark strips, external diameter 10–13·3 cm, depth 3·5–5 cm, internal diameter 7–7·7 cm, depth 1·5–3 cm; placed 3–17 m (typically c. 7 m) above ground and usually in fork on horizontal branch, often one covered in lichen, in S of range frequently in *Pterocarpus* or *Brachystegia*, often in dominant tree in landscape; nest less neat, wider, shallower and thicker-walled, and situated higher in tree, than that of *P. plumatus*; some nests less than 80 m from nest of latter. Clutch 2–5 eggs, usually 3–4, in Zimbabwe average 3·9 and in S of range 3·4, probably laid on consecutive days; replacement laid if early clutch lost; incubation, probably commencing when clutch complete, by all group-members, bird sitting very tight even when predator in close proximity, incubation period c. 17 days; chicks fed by all members of group, nestling period c. 20 days; post-fledging dependence period at least 3 months, young fully independent at c. 7 months, young remain in natal group until adult. Nests parasitized by Thick-billed Cuckoo (*Pachycoccyx audeberti*), e.g. 55% of 29 nests in Zimbabwe. Breeding success, at least in S Africa, only half that of other insectivorous birds in region and lower than that of *P. plumatus*, this likely related to high levels of cuckoo parasitism; in Zimbabwe, 14% of eggs produce fledglings, 18% of nests produce fledglings (reduced from 30% by cuckoo parasitism), average of 0·3 fledglings per nesting attempt, 2 fledglings per successful nest, 0·6 fledglings per group per year; nest contents and group-members vulnerable to avian predators, e.g. African Little Sparrowhawk (*Accipiter minullus*), and other predators; some chicks apparently starve to death. Can probably breed at 2 years. In Zimbabwe, 85% annual survival of adults (yearly variation 69–94%), 79% of fledglings survive first year (annual variation 49–95%).
Movements. Poorly known. Probably largely resident, with some post-breeding dispersive wandering out of breeding home range, especially during drought periods. Possibly some general E–W movement across range, numbers decreasing in W during austral winter.
Status and Conservation. Not globally threatened. Locally common to frequent across large parts of range. Densities typically five times less than those of *P. plumatus*; in S Mozambique, 35 birds/100 ha in *Brachystegia* but fewer than 5 birds/100 ha in other woodlands. Vulnerable to habitat degradation, such as destruction of *Brachystegia* woodland in Zimbabwe; in Kenya has apparently disappeared from Nairobi, Kiambu and Ngong regions.
Bibliography. Chapin (1954), Clancey (1960c), David & Gosselin (2002b), Dowsett *et al.* (2008), Friedmann (1937), Fry *et al.* (2000), Hall & Moreau (1970), Harris & Arnott (1988), Harris & Franklin (2000), Harrison *et al.* (1997), Heinrich (1958), Hockey *et al.* (2005), Newman & Hanmer (1991), Oatley (1969), Short & Horne (1985a), Tarboton (1963), Vernon (1971, 1980, 1984a, 1984b).

7. Gabela Helmet-shrike

Prionops gabela

French: Bagadais de Gabela **German**: Gabelabrillenwürger **Spanish**: Prionopo de Gabela
Other common names: Angola Helmet-shrike, Rand's (Red-billed) Helmet-shrike

Taxonomy. *Prionops gabela* Rand, 1957, Gabela area, Angola.
Forms a superspecies, and conceivably conspecific, with *P. retzii*. Monotypic.
Distribution. W Angola from Chio S along and below escarpment to Gabela.



Descriptive notes. 18–19 cm. Has head and neck to upper chest glossy black, slight crest on forecrown to lores projecting over beak; mantle and scapulars to rump grey, tinged brown, long black uppertail-coverts; remiges and outer primary coverts black, outer primaries with white central spots forming bar (visible in flight), inner upperwing-coverts grey; tail black, outer feathers with broad white tips, white decreasing in extent on inner tail feathers towards central pair, which narrowly tipped white; lower chest and upper belly grey, lower belly to undertail-coverts white, underwing-coverts and axillaries dark grey; iris yellow, conspicuous broad orange-red orbital ring with scalloped fringe (especially above eye); bill red, tipped orange-yellow; legs orange-red. Distinguished from very similar *P. retzii* by smaller size, grey (not black) lower breast and upper belly, crest projecting forwards over beak, and less pronounced wingbar restricted to outer primaries. Sexes similar; primary patch possibly smaller on female. Juvenile largely grey-brown above and below, with buff feather tips on upperparts, wing feathers often with narrow white tips, no orbital ring, eyes dark, bill blackish, legs yellow-orange. Voice. Almost unknown. Churring and clicking notes similar to those of *P. retzii*.
Habitat. Dry forest, gallery forest and secondary forest, also thickets and clearings, including coffee plantations in forest. Absent from nearby *Brachystegia* inhabited by *P. retzii*. Mainly 100–900 m; most recent records from dry forest at c. 300 m.
Food and Feeding. Diet insects, including larvae. Usually forages in canopy. Lives and forages in tightly knit groups of 3–8 individuals.
Breeding. Egg-laying apparently Jun–Sept. Likely co-operative breeder. No other information.
Movements. No information. Probably mainly resident, but records from dry thicket and open woodlands below escarpment suggest some post-breeding wandering.
Status and Conservation. ENDANGERED. Restricted-range species: present in Western Angola EBA. A very poorly known species. Has very small, fragmented range of c. 4600 km², and probably very small and declining population of c. 1000–2500 individuals. Previously known only from Gabela area, Londa, Mumbondo, and Roça Cassembo, and not uncommon in Amboim Forest. No records since 1970s until 2003, when group of eight individuals found in open woodland between Kumbira and Seles, at base of escarpment. In 2005, ten groups located in Kissama, Bimbe and Bango regions at elevation of 300 m, and away from base of escarpment. Threatened by habitat clearance by subsistence farmers, mainly for charcoal production but also for bananas, sweet potatoes, cassava, coffee and maize. In Gabela area, c. 30% of forest cleared prior to 1992 and large areas of forest currently being cleared for agriculture. This species is, however, tolerant of some habitat modification. With end of hostilities, human development in this area expected to be rapid. Relict coffee plantations, abandoned after onset of civil war in mid-1970s, now being encroached upon by subsistence agriculture; commercial activities on Angolan escarpment almost certain to

resume, including probable replacement of shade coffee with sun-tolerant varieties. Although marketing of local produce restricted by poor state of the Sumbe–Gabela road, this route is scheduled for early reconstruction, which would lead to increased development and agriculture in region. This species' range includes Kissama National Park.

Bibliography. Anon. (2008d), Butchart & Stattersfield (2004), Collar & Stuart (1985), David & Gosselin (2002b), Dean (2000b, 2001), Fry *et al.* (2000), Hall & Moreau (1962, 1970), Harris & Franklin (2000), Heinrich (1958), Rand (1957a), Ryan *et al.* (2004), Stattersfield & Capper (2000).

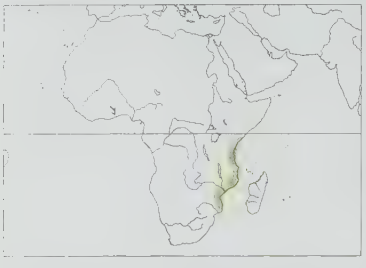
8. Chestnut-fronted Helmet-shrike

Prionops scopifrons

French: Bagadais à front roux **Spanish**: Prionopo Frentirrufo
German: Braunstirn-Brillenwürger

Taxonomy. *Sigmodus scopifrons* W. K. H. Peters, 1854, Mozambique.
Three subspecies recognized.

Subspecies and Distribution.
P. s. kirki (W. L. Sclater, 1924) – S Somalia (Boni Forest), coastal Kenya and NE Tanzania.
P. s. keniensis (van Someren, 1923) – C Kenya (Meru and Ngaia forests).
P. s. scopifrons (W. K. H. Peters, 1854) – coastal SE Tanzania, E Mozambique and extreme E Zimbabwe.



Descriptive notes. 16–18 cm; 20–40 g. Smallest member of family. Nominate race has slight, neat chestnut crest on forehead, forecrown light grey, lores white, upper chin sometimes with some white, hindcrown, nape and rest of head (ear-coverts and cheek) blackish-grey, upperparts paler grey with brown tinge; remiges and outer primary coverts blackish, primaries with broad white central bar (conspicuous in flight), tertials and inner upperwing-coverts grey; uppertail slightly glossy black, broad white tips on outer feathers, white decreasing in extent on inner feathers towards central pair, which narrowly tipped white; throat dark grey, chest and upper belly grey, lower belly to undertail-coverts white, underwing-coverts and axillaries grey; iris yellow with red-orange outer ring, bare skin at rear of eye purplish, conspicuous broad blue-grey orbital ring with scalloped fringe; bill red, tipped orange-yellow; legs red. Differs from *P. retzii* mainly in smaller size, greyer appearance, with chestnut crest and blue-grey orbital ring. Sexes similar, female slightly duller than male. Juvenile has brown head and crown feathers tipped whitish, body and wings paler and browner, feathers of upperparts tipped whitish and underparts faintly barred, wing feathers often with narrow white tips, no orbital ring, eyes brown, bill and legs blackish (both later yellow); acquires full adult appearance in second year. Race *kirki* is paler and browner above and below than nominate, forecrown even paler and more contrasting, pale throat contrasts strongly with darker cheeks, but lacks white on lores and chin, wingbar less pronounced; *keniensis* is larger, lacks light grey forecrown, wingbar even less pronounced than on preceding race (absent on upperwing, only faintly discernible below). Voice. Highly vocal and many calls similar to those of sympatric *P. retzii*, e.g. whistled song of both similar to that of Old World orioles (Oriolidae). At least some calls may reflect individual gender and social status. Typical call of nasal, grating notes likened to aggressive trill of Lesser Honeyguide (*Indicator minor*). Also other buzzing, chattering, chuckling, churring, gobbling, growling, humming, rattling, slurred, tinkling, trilling, whirring and winding calls, frequently alternated with whistling notes. Sharp "shuk" possibly in alarm. Bill-snapping characteristic.

Habitat. Mainly lowland and riverine forest and adjacent *Brachystegia* woodland, occasionally wandering to thickets and mangroves; in even better-developed woodland than that occupied by *P. retzii*. Sea-level to 1200 m. Typically occurs close to coast, but extends far inland in places, e.g. Meru and Ngaia forests (in C Kenya), E Usambara Mts, Uluguru Mts, Udzungwa Mts (Magombera and Mwanihana), Pugu Hills and single record from N Pare Mts (in E Tanzania), and Haroni–Rusitu confluence (in E Zimbabwe).

Food and Feeding. Diet insects, e.g. ant-lions (Myrmeleontidae), beetles (Coleoptera), caterpillars, grasshoppers (Orthoptera) and moths (Lepidoptera), as well as spiders (Araneae), small vertebrates, also fruit, e.g. *Ochna* berries. Hunts at all levels of forest; apparently prefers small-leaved trees and seeks prey among branches, trunks and thickets. Sometimes suspended upside-down in manner of a tit (Paridae) when hunting, and seems also to utilize auditory cues in prey location. Frequently takes flying prey on wing in fashion of muscicapid flycatcher (more so than *P. plumatus* and *P. retzii*), often while hovering. Sometimes flops into leaf cluster, apparently to flush prey. Occasionally takes prey on ground. Lives and forages in groups of 3–12 individuals (average seven) during breeding; up to 30 when non-breeding, but largest flocks likely aggregations of more than one group. Group-members more spread out and hence less conspicuous than those of *P. plumatus* and *P. retzii*. In winter months frequently joins parties of *P. retzii*, over which apparently dominant (and reported as outnumbering that species where the two occur together), and also, rarely, *P. plumatus*, as well as those of other bird species, e.g. Old World orioles, woodpeckers (Picidae) and, especially, Green Woodhoopoes (*Phoeniculus purpureus*); apparently does not attract such parties so often as do other members of family. Less shy than *P. retzii*.

Breeding. Egg-laying Dec–Jul (peak Jan–Apr) in N of range and Oct–Dec in S. Co-operative breeder, all group-members assisting in all aspects of breeding; groups likely comprise breeding pair and helpers. Nest solitary; territory large, and all group-members participate in territory defence. Courtship marked by soliciting, and wing-spreading and wing-flapping; claims of courtship feeding require corroboration. Several, probably all, group-members assist in nest construction; a shallow cup of grass and thin bark strips, bound with fibre, moss, lichen and, especially, spider web (web apparently transported in bill and on erectile frontal crest feathers), similar to that of *P. plumatus*, external diameter 6–6·5 cm, depth up to 4 cm, internal depth 2·5 cm; placed 4·5–23 m (average 12 m) up on branch or in fork in middle to upper canopy of large forest tree, e.g. *Brachystegia*, *Breonadia*, *Bridelia* or *Newtonia*, may prefer small-leaved trees for both nesting and foraging. Clutch 3 eggs; incubation, apparently initiated when clutch complete, by variable number of group (division of labour seems to be less marked than for *P. plumatus* and *P. retzii*, with fewer group-members incubating and for longer periods), sitting individual occasionally fed by other group-members; no information on duration of incubation and nestling periods; fledglings probably fed by all or most of group-members. No data on breeding success; aggressive towards, and will strike, potential predators, such as monkeys, eagles (Accipitridae) and owls (Strigidae).

Movements. Appears to be mainly resident; evidence of some post-breeding wandering in S of range.

Status and Conservation. Not globally threatened. Locally common within relatively small and highly fragmented range; numbers decreasing. In Mozambique, uncommon S of R Save but common N of it. Claimed record from Malawi retracted by observers. Reported occurrence in Honde Valley, in E Zimbabwe, and in NE South Africa require confirmation, owing to possible confusion with juvenile *P. retzii*. This species is concentrated along vulnerable and heavily exploited coastal zone with concomitantly high human densities and habitat destruction. Decreasing along most of coastal range, i.e. in Kenya, Tanzania and Mozambique, in many places dramatically, and in Mozambique, at least, threatened by forest and woodland destruction through logging and for subsistence cultivation. Tiny and peripheral Zimbabwe population, if still extant, seriously threatened by habitat destruction by subsistence farmers. Inland Kenyan race (*keniensis*) rare and endangered; has disappeared from Mt Kulal and Mt Marsabit and from Embu District, apparently for reasons largely unrelated to habitat destruction. Current trends suggest that this species is likely to become threatened in foreseeable future.

Bibliography. Britton & Britton (1971, 1977), Fry *et al.* (2000), Hall & Moreau (1970), Harris & Arnott (1988), Harris & Franklin (2000), Harrison *et al.* (1997), Hockey *et al.* (2005), Newman (1991), Newman & Hanmer (1991), Short & Horne (1985a), Solomon *et al.* (1996), Zimmerman *et al.* (1996).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family VANGIDAE (VANGAS)



- Small to medium-sized passerines varying considerably in morphology and plumage.
- 13–32 cm.



- Madagascar, one species also in Comoro Islands.
- Forest, scrub and thorn-scrub, plantations and wooded areas near forest.
- 12 genera, 15 species, 22 taxa.
- 4 species threatened; none extinct since 1600.

Systematics

According to O. Langrand, in his 1990 *Guide to the Birds of Madagascar*, the family Vangidae consisted of 14 species, of which only the Blue Vanga (*Cyanolanius madagascarinus*) extends beyond the boundaries of Madagascar, being found also in the nearby Comoro Islands. Historically, the majority of the vangids were placed with the shrikes in the family Laniidae, and they have, until recently, generally been considered to be closely related to laniids. In 1932, J. Delacour recognized the vangas as a separate family, for which he used the name *Vangidés*, although this, being a French word, was inappropriate according to the rules of the International Code of Zoological Nomenclature. Four years later, the American ornithologist A. L. Rand renamed the family, employing the name "Vangidae", which is a Latinized version of Delacour's original French name.

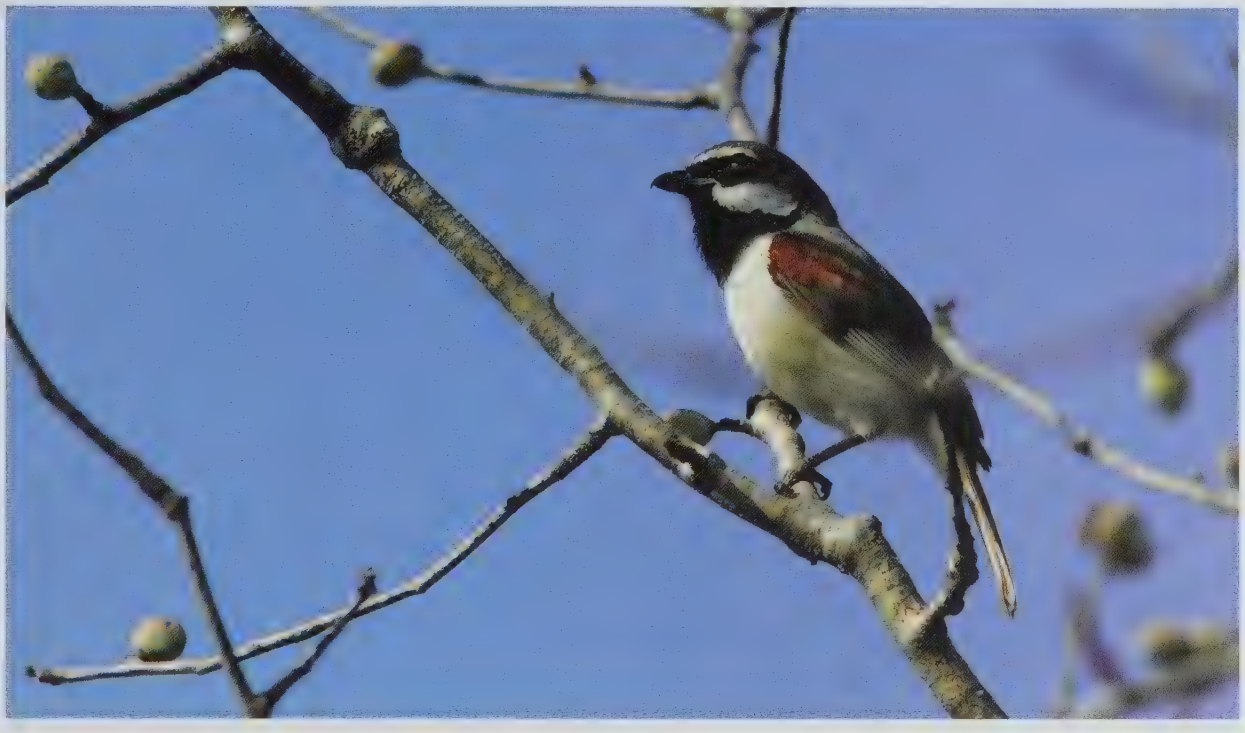
Although Rand was thus the first to establish the family Vangidae, his account is very different from the current classification. He assigned the genus *Tylas* to the bulbul family (Pycnonotidae), and he accorded the monotypic genera *Euryceros* and *Hypositta* family status, as, respectively, Eurycerotidae and Hyposittidae. In 1960, in J. L. Peters's *Check-list of Birds of the World*, Rand continued to place *Tylas* with the bulbuls, but he aligned *Hypositta* with the tit family (Paridae). In that same year, however, J. Dorst presented another classification of the vangas, in which he included 14 species, those currently recognized as constituting the family. At the time, the Red-shouldered Vanga (*Calicalicus rufocarpalis*) had not been described. Dorst based his treatment on the morphological similarities among the members of this family, features such as the shape of the skull, the attachment of the jaw muscles, the pterylae of nestlings and the scutellation of the tarsus, and he placed both *Hypositta* and *Tylas* in the Vangidae. Others have assigned *Tylas* either to Pycnonotidae, as had Rand, or to the Old World orioles (Oriolidae), the thrushes (Turdidae) or the starlings (Sturnidae).

It has for long been recognized that the vangas represent a radiation confined within the Madagascar region. The question of the monophyly of this group, however, remained unresolved. Recent research, using DNA-sequence data from several different genes, both mitochondrial and nuclear, supported the validity of the traditional view, namely that the Vangidae formed a monophyletic group, and that the Tylas Vanga (*Tylas eduardi*) was a member of this family. More remarkably, recent authors not only retained all of the current taxa of the Vangidae within this family, but included in it, on the basis of DNA analyses, several additional taxa previously assigned to other families. These are the newtonias (*Newtonia*), which have generally been placed with the Old World warblers (Sylviidae) or the Old World flycatchers (Muscicapidae), Ward's Shrike-flycatcher (*Pseudobias wardi*), often included with the batises and wattle-eyes (Platysteiridae), and the Madagascar Groundhunter (*Mystacornis crossleyi*), which has been aligned with the babblers (Timaliidae), although frequent doubts have been expressed over the true affinities of these species. It seems very likely that all of them should, indeed, be placed in Vangidae, and this has been the preferred arrangement by most recent authors, including E. C. Dickinson in the third edition of *The Howard and Moore Complete Checklist of the Birds of the World*.



The radiation of the Vangidae may surpass that of Darwin's finches (Emberizidae) or Hawaiian honeycreepers (Drepanididae) in terms of the number of genera into which they have differentiated, and the diversification of body size, bill shape and plumage coloration. Recent DNA-sequence analysis suggests that they form a monophyletic group with an African origin. Some forms fill niches that are occupied elsewhere by woodpeckers (Picidae), shrikes (Laniidae), tits (Paridae) and nuthatches (Sittidae), all of which are absent from Madagascar. The ***Hook-billed Vanga*** *is a shrike-like, sit-and-wait predator found in many forest habitats.*

[*Vanga curvirostris curvirostris*, Ampijoroa, Madagascar. Photo: Ketil Knudsen]



*The **Red-tailed Vanga** is a small vanga reminiscent of a tit (Paridae). The inclusion of the genus* Calicalicus *in Vangidae has been generally accepted for over half a century. But though recent molecular-genetic analysis places it close to other vanga genera, analysis of morphological characters suggests it may not belong in the family at all, but could be closer to the drongos (Dicruridae) and the monarch-flycatchers (Monarchidae). The same analysis contradicts the DNA evidence for an African origin, suggesting that the most recent common ancestor of the vangas reached Madagascar from the east.*

[*Calicalicus madagascariensis*, Madagascar. Photo: Jürgen Schneider]

S. Yamagishi and colleagues undertook a detailed study of the phylogenetic relationships of the Vangidae and produced a dendrogram to illustrate the results. They used the Bull-headed Shrike (*Lanius bucephalus*), in the family Laniidae, and the Australian Magpie (*Cracticus tibicen*), a member of the butcherbird family (Cracticidae), as outgroups. The phylogenetic relationships revealed in this study suggest that the Vangidae have a closer relationship with the cracticids than they do with the shrikes. It appears that, within a relatively short period of time after arriving in Madagascar, the common ancestor of the vangids simultaneously differentiated into five lineages. The first of these, "group 1", contains the Tylas Vanga, and "group 2" the Nuthatch Vanga (*Hypositta corallirostris*); the third group contains the ancestor of the Chabert Vanga (*Leptopterus chabert*) and the Common Newtonia (*Newtonia brunneicauda*), while "group 4" consists of the ancestor of the Sickle-billed Vanga (*Falculea palliata*), White-headed Vanga (*Artamella viridis*), Bernier's Vanga (*Oriolia bernieri*) and Van Dam's Vanga (*Xenopirostris damii*); the final lineage, "group 5", is the ancestor of the Blue Vanga, Red-tailed Vanga (*Calicalicus madagascariensis*), Hook-billed Vanga (*Vanga curvirostris*), Helmet Vanga (*Euryceros prevostii*) and Rufous Vanga (*Schetba rufa*). The order in which the groups diverged is not clear from the molecular data, but these do indicate that the ancestor of group 3 split into the Chabert Vanga and the Common Newtonia approximately 2·3 million years ago, and that of group 4 differentiated into the White-headed, Bernier's and Van Dam's Vangas approximately 1·1 million years ago, after the Sickle-billed Vanga had separated from the ancestor. Lastly, the ancestor of group 5 differentiated into the Helmet Vanga and the Rufous Vanga approximately 800,000 years ago.

A high degree of similarity exists between the group consisting of the Sickle-billed, White-headed, Bernier's and Van Dam's Vangas and that comprising the Helmet and Rufous Vangas, which has differentiated relatively recently. Although there is great diversity in bill shape within each group, as demonstrated by the Sickle-billed and White-headed Vangas, and the Helmet and Rufous Vangas, there are close similarities in plumage coloration. The vangas belonging to the former group show black-and-white coloration with the mouth deep black (see Morphological Aspects), whereas the plumage of the latter group is rufous-brown and black. The coloration resemblance within a group is especially marked in the case of the Sickle-billed and White-headed Vangas in group 4 and, in group 5, the Helmet and Rufous Vangas, although all of the species differ in the type of bill that they possess. In other words, the development of such variation as is found in bill size and shape appears to have occurred in a relatively short timespan of one million years or so. In contrast, variation in plumage coloration appears to have been more conservative and gradual.

There are two well-known examples of avian adaptive radiation on remote islands. These are the group of birds commonly known as "Darwin's finches" (Emberizidae), on the Galapagos Islands, and the Hawaiian honeycreepers (Drepanididae), in the Hawaiian Islands. Darwin's finches are textbook examples of the diversification of a single founding population into an array of taxa adapted in varying ways to diverse environmental niches of the Galapagos and Cocos Islands. Hawaiian honeycreepers likewise have adapted to the new environments through evolutionary changes in bill shape and coloration. The radiation of



Sole member of the genus Oriolia, ***Bernier's Vanga*** *is a medium-sized vanga with a stout conical bill. This species is sexually dimorphic: the male is entirely glossy black, whereas the female is dark rufous-brown with fine black barring. Within a relatively short period of time after arriving in Madagascar, the common ancestor of the vangas simultaneously differentiated into five lineages. Bernier's Vanga is part of a lineage which includes the Sickle-billed* (Falculea palliata)*, White-headed* (Artamella viridis)*, and Van Dam's Vangas* (Xenopirostris damii)*. These vangas have each taken on part of the role of woodpeckers (Picidae); Bernier's is able to cling to almost vertical trunks in woodpecker fashion.*

[*Oriolia bernieri*, Masoala National Park, Madagascar. Photo: Andrew Moon]



Ten of the twelve currently recognized vangid genera are monospecific, and the extraordinary diversity in size, colour and bill shape leads to taxonomic confusion even today. There can be no such confusion with the three members of the genus Xenopirostris. *All are stocky and possess a thick, laterally compressed bill which they use as a tool for ripping bark from dead wood.* ***Lafresnaye's Vanga*** *has mostly black and white plumage. This bird is a female; the male has a black head with a broad white collar.*

[*Xenopirostris xenopirostris*, Berenty, Madagascar. Photo: Ketil Knudsen]

Malagasy vangas may surpass that of Darwin's finches or the Hawaiian honeycreepers in terms both of the number of genera into which they have differentiated and the diversification of body size, bill shape and plumage coloration.

Only very recently has a full cladistic analysis of the relationship of vangas based on morphological characters been undertaken. This study, carried out by A. Manegold, looked at 40 morphological characters of 36 vangid and non-vangid taxa, and the results were published in 2008. Most interestingly, Manegold's findings indicated that the Tylas Vanga, the Madagascar Groundhunter and the newtonias did not belong in the Vangidae, despite the preferences of most recent taxonomists. Moreover, he suggested that the Red-tailed Vanga, too, should be excluded from the family. Manegold's analysis led also to the hypothesis that the "true" vangas, as defined in his study, formed a monophyletic group with the Australasian woodswallows (Artamidae) and the Australo-Papuan butcherbirds, and that the sister-taxon of this clade was probably the New Guinean peltops (*Peltops*). If such a relationship were to be confirmed, it would imply that the most recent common ancestor of the vangas reached Madagascar from the east, following a process of dispersal across the Indian Ocean. This hypothesis conflicts with those derived from DNA-sequence analysis, which propose the helmet-shrikes, bush-shrikes and platysteirids as the closest relatives of the vangas, therefore indicating an African origin of this group. On the other hand, it accords in part with the findings of W. P. Pycraft, published a century ago, in 1907.



Although there are great differences between the bills of the Sickle-billed Vanga (Falculea palliata) *and* ***White-headed Vanga****, there are close similarities in their plumage coloration. These species apparently split from their common ancestor around 1·1 million years ago. A similar differentiation in bill size and shape, but similarity in plumage, is found in two members of another lineage, Helmet* (Euryceros prevostii) *and Rufous Vangas* (Schetba rufa). *Thus, while development of such variation as is found in bill size and shape appears to have occurred in a relatively short time span, variation in plumage coloration appears to have been more conservative and gradual. Two races of White-headed Vanga are tentatively recognized, based on a slight difference in bill size.*

[*Artamella viridis annae*, Ampijoroa, Madagascar. Photo: Ketil Knudsen]

Although the taxonomic position of *Calicalicus* in Vangidae has been generally accepted for well over half a century, this taxon lacks almost all of the derived characters which the butcherbirds, vangas and woodswallows share. Manegold's findings suggest that the Red-tailed Vanga is probably closer to the drongos (Dicruridae) and the monarch-flycatchers (Monarchidae) than it is to the vangas. In this context, it is noteworthy that O. Appert, in his extensive study on the biology of the Vangidae, emphasized the fact that the Red-tailed Vanga differs from other members of the family in its nest-building behaviour, as well as in the colour and markings of its eggs.

Not only are ten of the twelve currently recognized vangid genera monotypic, but nine of the 15 species are likewise monotypic. Of the polytypic species, two exhibit rather poorly marked subspecific differentiation and are perhaps better considered monotypic. The western and southern race of the White-headed Vanga, *annae*, differs from the nominate race only in having a very slightly longer bill. Similarly, the western race of the Rufous Vanga, *occidentalis*, has a marginally longer and heavier bill than that of the nominate race, which it otherwise resembles closely.

On the other hand, the populations of the Blue Vanga inhabiting the Comoro Islands are sometimes treated as a separate species, distinct from those on Madagascar. The two Comoro subspecies are larger than the nominate, Madagascan race, and they appear to differ further from it in plumage and bill size, the



*The **Sickle-billed Vanga** is probably the most distinctive member of the family, with its exceptionally long, markedly decurved bill. At 32 cm, with a bill length of up to 7 cm, and weighing as much as 199 g, the Sickle-billed Vanga is the largest of the vangas. This species is not sexually dimorphic. The black upperparts have a blue sheen; in the otherwise similarly plumaged White-headed Vanga* (Artamella viridis) *the sheen is green. Like two other members of its lineage, the White-headed and Van Dam's Vangas* (Xenopirostris damii), *the Sickle-billed Vanga has the inside of the mouth an intense black, as though painted with black ink.*

[*Falculea palliata*, Ifaty, Madagascar. Photo: Jacques Erard]

male having the entire upperside washed lilac, the inner webs of the inner secondaries blue, rather than black, and the bill longer and thinner. In addition, the subspecies on Mohéli, *comorensis*, is reported as uttering a grating "prrrt" call which is softer than a similar note of the nominate race, and also a more protracted "teea". The Grand Comoro subspecies, *bensoni*, is extremely rare and very poorly known (see Status and Conservation). It seems to be very similar to *comorensis*, but with a shorter bill, and should perhaps be treated as a synonym of the latter.

Finally, the poorly known western subspecies *albigularis* of the Tylas Vanga appears to differ from the nominate race in plumage and voice, having a white throat and a pale pinkish-orange breast and belly, whereas the nominate race has a complete black hood extending down to the throat and uppermost breast and has deep orange-buff underparts. Because of these differences, *albigularis* has sometimes been thought to represent a separate species. In this case, however, there seems to be some individual variation and overlap in plumage characters, and a few individuals of each race exhibit plumage features typical of the other race. Moreover, observations at Ambohitantely and other higher-lying parts of its range have revealed that both white-throated and black-throated Tylas Vangas occur in one and the same area.

In 1996, D. S. Peters came across two odd specimens in a drawer in the bird collection of the Senckenberg Research Institute and Natural History Museum, in the German city of Frankfurt am Main. It was immediately obvious that these were unlike any other Madagascan bird species hitherto known. They were similar in size to the Nuthatch Vanga, and had the same loose plumage structure as the latter. The plumage was plain olive-brown, with a blackish forehead. In particular, the tarsus was much longer and the toes significantly shorter than those of the Nuthatch Vanga, which seemed to be the closest relative of this supposed new taxon. Both specimens were deemed to be recently fledged juveniles, and they were described as a new species, "*Hypositta perdita*". The two specimens had been collected in 1931, in primary forest near Eminiminy, a village north of Tôlanaro, formerly known as Fort Dauphin; the locality is adjacent to the Andohahela National Park, in south-east Madagascar. The apparent new species was given the English vernacular name of "Bluntschli's Vanga", after the original collector, H. Bluntschli. Unfortunately, no further individuals have ever been seen in the wild. It is impossible to determine the true taxonomic status of these two juveniles, and it could be that they are simply aberrant examples of, perhaps, the Nuthatch Vanga. Nevertheless, it remains feasible that they do, indeed, represent a different species, or a subspecies, but the little that is known of "Bluntschli's Vanga" precludes any valid assessment.

*Recent genetic analysis indicates that the ancestor of the **Chabert Vanga** split into this species and the Common Newtonia* (Newtonia brunneicauda) *around 2·3 million years ago. The Chabert Vanga is a relatively small, black-and-white vanga, with a ring of bright blue bare skin around the eye. The sexes are similar, whereas the juvenile lacks the blue eyering. The Chabert Vanga has a "generalized" bill, rather than one of the highly specialized bill types found in some other members of the family. It catches insects in the air, in the manner of a flycatcher, and makes use of all the forest types on Madagascar, including secondary growth and plantations, sometimes far from native forest.*

[*Leptopterus chabert schistocercus*, Ifaty, Madagascar. Photo: Jimmy Chew]

Morphological Aspects

Of the several avian families endemic in Madagascar, Vangidae is probably the best-known one. Such is the diversity in size,





*The **Blue Vanga** is the only member of the family found beyond the shores of Madagascar. The populations of the Blue Vanga inhabiting the Comoro Islands are sometimes treated as a separate species. The race* comorensis, *from Mohéli in the west-central Comoros, is larger than the Madagascan nominate form, with a longer, thinner bill, and with distinct differences in plumage, such as the very bright upperparts of the male; its calls also differ. The extremely rare and poorly known Grand Comoro race,* bensoni, *is very similar to* comorensis, *but with a shorter bill.*

[*Cyanolanius madagascarinus comorensis*, Mohéli, Comoro Is. Photo: Pete Morris]

colour and, in particular, bill size and shape shown by the 15 species currently included in the family that it is difficult to imagine that they are related at all. The high degree of morphological divergence leads to taxonomic confusion even today.

So far as body length is concerned, vangas range from 13 cm, as in the case of the Nuthatch Vanga, to 32 cm, the length of the Sickle-billed Vanga, a size increase of almost 250%. Plumage colour is diverse, with white, black, blue, auburn and ash-grey exhibited among the various species. The scientific names reflect this. For example, the Hook-billed Vanga is *Vanga curvirostris*, "vanga" being a Malagasy word for "black-and-white" and the specific epithet meaning "curved bill" in Latin. Thus, the nomenclature signifies "black-and-white bird with a curved bill". The plumage of the Hook-billed Vanga is pied. The White-headed Vanga also has a black-and-white body, but its body size and bill size are smaller than those of the Hook-billed Vanga.

Bill shape varies so widely across the family that one could be forgiven for thinking that the vangas belong to several different families. On the basis of the combined measurements of six bill elements, there are five basic types of bill. Using the analogy of gripping tools, these are: the "forceps type", as possessed by the Sickle-billed Vanga; the "radio pliers type", as on the White-headed and Hook-billed Vangas; the "strong pincers type", presented by Pollen's (*Xenopirostris polleni*), Lafresnaye's (*Xenopirostris xenopirostris*) and Van Dam's Vangas; the "pliers type", as on the Helmet Vanga; and the "generalized type", demonstrated by the Rufous, Blue, Chabert, Red-tailed, Nuthatch and Tylas Vangas. The last group can be split into two subgroups, the Rufous, Blue, Chabert and Red-tailed Vangas representing the "standard type" and the Tylas and Nuthatch Vangas representing the "flat forceps type". Thus, the vangas may be divided into six groups according to bill type.

The bill shape and foraging behaviour of vangas resemble those of, variously, the shrikes, the tits, and the treecreepers (Certhiidae), among others. Today, vangas fill niches that are occupied, in other parts of the world, by woodpeckers (Picidae), woodhoopoes (Phoeniculidae), shrikes, tits, treecreepers and nuthatches (Sittidae), all of which are absent from the Madagascar region.

Bill size and shape reflect the size of the insect prey taken, the precise site where it is caught and the mode of its capture. Larger species, such as the Hook-billed Vanga, have a robust bill with a characteristic hook at the tip, which help them in dealing with their carnivorous diet of large insects, chameleons (Chamaeleonidae) and other small vertebrates. The Helmet Vanga has a massive blue bill, 51 mm long and 30 mm deep, and this species likewise feeds on large insects and chameleons. Bernier's Vanga, which may not be a true vangid (see Systematics), is smaller than the Helmet Vanga and has a fairly stout, conical bill suited to its diet of invertebrates and very small vertebrates. The male is entirely glossy black, whereas the female is dark rufous-brown with fine black barring.

Members of the genus *Xenopirostris* use the laterally compressed bill as a tool for ripping bark from dead wood. All three species are stocky in build and possess a thick bill. In contrast, the much smaller and less bulky Chabert Vanga behaves in the manner of a flycatcher, employing its thick bill for the purpose of catching insects in the air. This species has a highly distinctive broad ring of bright blue bare skin around the eye.

The Sickle-billed Vanga is the largest and the most easily identifiable member of the family. It has an exceptionally long bill, up to 70 mm in length, which is markedly decurved, and light grey in colour. The extraordinary shape of this bill, which is used for probing crevices in the bark of trees, presents a stark contrast to the huge deep bill of the Helmet Vanga. The Sickle-billed, White-headed and Van Dam's Vangas have an intense black coloration inside the mouth, as if it had been painted with black ink.

Rather small to medium-sized for a vangid, the Rufous Vanga is distinctive in its tricoloured plumage, with black on the head, white on the breast and reddish-brown on the back. Whereas the Hook-billed, Helmet and Sickle-billed Vangas are not sexually dimorphic, the Rufous Vanga displays clear sexual differentiation in plumage. The male has the entire head and the region from the throat to the breast black, while the female has only the area from the head to just below the eyes black, the cheeks and the area from the throat to the breast being white. This species is a co-operative breeder (see Breeding), and helpers, all of which are males, exhibit two types of plumage coloration. One is fully black-throated and is identical to the plumage of the paired male, while the other type has the throat whitish with black spots, the latter representing the immature male.



The distinctive, tri-coloured ***Rufous Vanga*** *shows clear sexual dimorphism. The male has the entire head and the region from the throat to the breast black, while the female is black down only to just below the eyes, the cheeks and the area from the throat to the breast being white. There are two recognized subspecies of this medium-sized vanga, with its strong, broad, "generalized" bill. The western race* occidentalis *differs from the nominate only in its slightly longer, heavier bill, and the species may better be regarded as monotypic.*

[*Schetba rufa occidentalis*, Ampijoroa, Madagascar. Photo: Jacques Erard]

Similarly, the White-headed Vanga exhibits sexual dimorphism in plumage. The male is all white except for a glossy black mantle, rump and tail, but the female has the head greyish. This species, too, is a co-operative breeder, but in its case the helper, probably a male, is always in immature plumage, similar to that of the female.

The smaller vangid species, including Red-tailed, Red-shouldered, Nuthatch and Blue Vangas, have a much finer bill, one which is suited more to gleaning small insects on branches and tree trunks. The Tylas Vanga was once classified as a bulbul. It resembles Pollen's Vanga in plumage coloration, but has a much finer bill.

Habitat

Vangas are found in all forest habitats of Madagascar. They are distributed over the entire area of the island, except for the central highlands. The highlands support steppe vegetation, which is dominated by shrubs, but these are mostly small and patchily distributed. Several arboreal birds, including vangas, are therefore absent from the central highlands.

The island-wide distribution of this family does not imply that all species of vanga are found in almost all parts of the island. The central highlands divide the climate of Madagascar into two distinct regions, the dry western region and the humid eastern region, and the vegetation is likewise clearly separated into two main types, while the southern region has a semi-arid climate. The western region is vegetated with deciduous broadleaf forest, the eastern region is dominated by tropical or montane rainforest, and the southern region is characterized by thorn-forest with plant species adapted to arid environments.

General observations indicate that the Red-tailed Vanga lives in native forest of various types, including deciduous forest in the west and evergreen humid forest in the east, and extending into adjacent second growth, but it normally avoids sub-arid scrub. Sub-arid thorn-scrub seems, however, to be the primary or exclusive habitat of its sole congener, the recently described Red-shouldered Vanga. Hook-billed Vangas are denizens of native forest, including primary and degraded forest, and are particularly fond of dense scrub-forest. They can be seen also around villages, and are recorded even in plantations far from natural forest. Bernier's Vanga is confined to evergreen humid forest in the lowlands, ascending to about 1000 m, but it is patchily distributed and is generally scarce.

Lafresnaye's Vanga inhabits sub-arid thorn-scrub, exhibiting a strong preference for areas with plentiful dead wood. It is observed most frequently in native spiny forest with areas of euphorbia (*Euphorbia*) and octopus tree (*Didierea*), and occurs from sea-level to 100 m. This species' two congeners are found only in primary forest, Van Dam's Vanga in western deciduous forest and Pollen's Vanga in eastern evergreen humid forest; both will occasionally visit wooded areas immediately adjacent to these habitats. Sickle-billed Vangas occur in dry forest and thorn-forest, in savanna with sufficient trees, and in the wooded outskirts of villages.

The White-headed Vanga is common and widespread in Madagascar, where it is found in all types of native forest, as well as in savanna and in wooded areas distant from native forest. The nominate race occurs mainly in evergreen humid forest in the east of the species' range, while subspecies *annae* is distributed in various habitats in the west and south of the island. Similarly widespread, the Chabert Vanga also utilizes all forest types, including secondary growth and plantations, as well as scrubby vegetation, sometimes far from native forest. The nominate race is common in eastern forests, especially evergreen humid forest, and is particularly numerous on the edges of western primary forest, while the south-western subspecies, *schistocercus*, is reasonably common in wooded areas. The species is found at up to 1800 m, but it is most common below 1000 m.

The Blue Vanga is present on both sides of Madagascar, inhabiting deciduous dry forest and adjacent second growth in the west and evergreen humid forest in the east, and ranging from sea-level to about 1200 m. Very occasionally, it is recorded at higher elevations, to 1600 m, in areas where large trees are present, but it appears to be absent from the subdesert areas of the south-west and south. This is the only member of the family that occurs outside Madagascar, the races *comorensis* and *bensoni* being found in forest habitats in the Comoro Islands, between the north-east coast and the African mainland.

Lowland primary forest is the habitat of the Rufous Vanga, which occupies the deciduous forest of the west and the ever-



*The **Helmet Vanga** and the Rufous Vanga* (Schetba rufa) *were apparently the last vanga species to become differentiated, when they split from their common ancestor probably around 800,000 years ago. The Helmet Vanga's massive, arched and hooked blue bill, 51 mm long and 30 mm deep, is unmistakable. Despite this conspicuous feature, this species is difficult to find, as it is secretive and often sits immobile in the subcanopy for long periods. The bill of the juvenile is initially horn-coloured, and the plumage is buff where the adults are black, and dark brown where the adults are rufous.*

[*Euryceros prevostii*, Masoala National Park, Madagascar. Photo: Nick Garbutt/ Indri Images]

green humid forest of the east. It prefers an open understorey and large trees. Helmet Vangas are found only in dense evergreen humid forest, chiefly at 400–900 m, but sometimes down to 200 m and occasionally to 1800 m.

The remaining two species in the family have largely overlapping distributions in eastern Madagascar, each in undisturbed rainforest. The Tylas Vanga occasionally ventures into adjacent second growth, and both it and the Nuthatch Vanga are found from sea-level to 1800 m. A second subspecies of the Tylas Vanga occurs in western Madagascar, where *albigularis* has been recorded from sea-level to approximately 900 m in deciduous dry forest and, on a few occasions, in mangroves. It is, however, a very poorly known taxon, and appears to be rare and local.

The distribution of each species of vanga is closely related to and dependent on the climate and vegetation. For example, Bernier's Vanga and the Helmet Vanga are found primarily in the Masoala Peninsula, in the north-eastern part of Madagascar, whereas the Nuthatch and Pollen's Vangas are distributed in the rainforest of the humid eastern region. In contrast, the Sickle-billed Vanga is restricted to the dry forest of the western region. The Hook-billed and White-headed Vangas can be found throughout the eastern and western parts of the island. The Tylas Vanga, on the other hand, occurs chiefly in the eastern part of the island, its distribution on the western side being limited. Van Dam's Vanga is found only locally in the dry western region. The Red-tailed, Blue and Rufous Vangas are distributed extensively over the eastern and western regions of the island, but are absent from semi-arid thorn-forest, as well as the central highlands. Both Lafresnaye's Vanga and the Red-shouldered Vanga are found in south-western Madagascar, and the recently described Red-shouldered Vanga is known only from the Toliara region of the south-west.

General Habits

All vangas are distinctly arboreal, spending most of each day in foraging, often quietly, in the trees within their territories. Despite the the fact that the vangids are adapted to an arboreal life, one species, the Rufous Vanga, sometimes descends to the ground and even forages there, hopping along.

Although the vangas differ strikingly in their morphology and foraging behaviour, the differences between the species in terms of their social structure appear to be marginal. The vangas have speciated within forest habitats, but have barely colonized habitats beyond the forest. Although the habitat is structurally complex, the width of the habitat niche and the width of the feeding niche are relatively narrow. This situation seems not to have affected the social structure of the various species.

Outside the breeding season, vangas may be engaged in highly social activities in two distinct situations. These concern mixed-species flocks and communal roosts. A characteristic feature of forest-dwelling birds in tropical regions, including Madagascar and the Comoros, is the formation of mixed-species flocks, particularly outside the breeding season. These flocks are generally seen in the lower strata of forests. In Madagascar, vangas usually constitute the mainstay of multi-species foraging flocks, which sometimes include more than one species each of vanga and newtonia and often contain other small forest passerines, such as jeries (*Neomixis* and *Hartertula*), weavers (*Ploceus*), drongos, the Madagascar Cuckoo-shrike (*Coracina cinerea*), tetrakas (*Bernieria* and *Xanthomixis*), paradise-flycatchers (*Terpsiphone*) and *Cinnyris* sunbirds. The Rufous Vanga is often a leader in mixed flocks. This species exhibits no change in foraging behaviour when in mixed-species flocks and does not increase its foraging rate in line with that of other species.

During the non-breeding season, the Sickle-billed Vanga forms large flocks of 20–30 or more individuals, and at night it gathers in large communal roosts containing in excess of 50 individuals. The roosting behaviour of this gregarious species is accompanied by noisy babbling, cackling calls. A tall roadside eucalypt (*Eucalyptus*), an introduced tree species, is often selected as a roosting site by Sickle-billed Vangas, and it is thought that the birds use the same tree throughout the year as a communal roost-site. From mid-October to early December, the number of Sickle-billed Vangas present at the roost decreases as breeding pairs leave in order to build their nests in their respective breeding territories. The ones that remain at the roost during this period are likely, therefore, to be unpaired non-breeding individuals, which forage together in a group over a large area. From mid-December onwards, the number of individuals at the roost increases rapidly again, being augmented by the influx of non-

*Earlier authors placed the **Tylas Vanga** in the bulbul family, Pycnonotidae, while others situated it among the Old World orioles (Oriolidae), thrushes (Turdidae) or starlings (Sturnidae). Although recent genetic research indicates that it belongs in Vangidae, this is not supported by cladistic analysis of vanga relationships based on morphological characters. In the context of vangas, this species is medium-sized and rather slender, with a fine bill of the "flat forceps" type. The western race* albigularis *differs so markedly from the nominate in plumage and voice that it is sometimes thought to be a separate species. But a few individuals of each race exhibit characters typical of the other, and white-throated and black-throated forms can occur together.*

[*Tylas eduardi eduardi*, Masoala National Park, Madagascar. Photo: Ketil Knudsen]



breeding individuals and the juveniles which have fledged during the breeding season.

Two other species, the White-headed and Chabert Vangas, show communal roosting behaviour. Like the Sickle-billed Vanga, the Chabert Vanga apparently uses the same tree as a communal roosting site throughout the year. Surprisingly, perhaps, the Rufous Vanga has not been found to roost communally, although it regularly forages in small groups, frequently joins mixed parties, and breeds co-operatively (see Breeding).

Little information is available on the natural predators of vangas. In the dry deciduous forest of western Madagascar, it seems likely that certain raptors and other predators raid the nests of some species (see Breeding). Vangas mob potential predators, such as couas (*Coua*), drongos, brown lemurs (*Eulemur fulvus*) and snakes. The partners, or the flock-members, gather near the predator and utter short and sharp alarm calls. Often, they will cautiously approach the predator, some individuals displaying more aggressively than do others, by arching the neck and drooping the wings.

*Another species that has at various times been assigned to different families is the **Nuthatch Vanga**, the smallest vangid. As its name suggests, this species fills the niche of a nuthatch (Sittidae) in Madagascar. Two juvenile specimens found in a museum drawer, with similar plumage to the Nuthatch Vanga, but a much longer tarsus and shorter toes, were given the name "*Hypositta perdita*", Bluntschli's Vanga. No others have ever been found, and to date it has not been possible to determine their true taxonomic status.*

[*Hypositta corallirostris*, Perinet Special Reserve, Madagascar. Photo: Ketil Knudsen]

Voice

The vocal repertoire of vangas is rich and the pattern of their vocal communication is complex. The most powerful vocalization is the call of the Sickle-billed Vanga, similar to the cawing of a *Corvus* crow. This call is often delivered from the top of a canopy tree or from within vegetation. In contrast, the call given regularly by the Blue Vanga is a very characteristic angry and vowel-less rattle. The voice of Bernier's Vanga is poorly known.

Definite songs are delivered by the Hook-billed Vanga, all three *Xenopirostris* species, and the White-headed and Tylas Vangas. The song of the Hook-billed Vanga is a very penetrating, high-pitched whistle lasting for about two seconds, somewhat ventriloquial and very difficult to locate, repeated at brief intervals. This is often heard in the early morning, and two individuals occasionally counter-sing. The *Xenopirostris* species utter a similar protracted whistle. Male White-headed Vangas defend dispersed territories, in which they have regular songposts; from these the male sings a whistling "weety-woo weety-woo weety-woo". Similarly, the Tylas Vanga utilizes regular songposts, from which it delivers a repeated "weeta weet yew-ew".

In addition, Red-tailed and Red-shouldered Vangas have whistled songs. The former utters a delightful "per-whew", similar to a wolf-whistle made by a human, but in the western parts of its range this species gives a different song, typically "pew-poo-whee" or "oo-oo-whi", the last syllable higher than the preceding ones; moreover, in the area of Morondava, on the central part of the west coast, a song sounding like "plee-plee tick-che-weh" has been heard. The Red-shouldered Vanga's song is a loud "tyuh-tee" or "pu-teer", the second note louder and more whistled than the first, and it is often answered immediately by the female, which emits a contact call.





*The song of the **Hook-billed Vanga**, often heard in the early morning, is a very penetrating, high-pitched whistle lasting for about two seconds, and repeated monotonously at regular short intervals. Somewhat ventriloquial, it is very difficult to locate. Two individuals will often counter-sing. Basic information on territorial behaviour is lacking for most members of Vangidae. The most powerful vocalization is given by the Sickle-billed Vanga* (Falculea palliata), *which has a call like a crying baby. Its alarm call attracts many other birds to mob a predator, as does the call of the Rufous Vanga* (Schetba rufa), *the dominant species in mixed flocks.*

[*Vanga curvirostris cetera*, Reniala, Madagascar. Photo: Ian Merrill]

The calls of the Red-tailed, Red-shouldered, Chabert and Nuthatch Vangas are more rattled and complex, and include a trill. The Chabert Vanga, for example, has a characteristic "tch-tch-tch-tch" call, often emitted by several members of a group, and this frequently attracts the human observer's attention to the presence of a group of this species in flight overhead. Nuthatch Vangas emit series of quiet hissing or squeaking notes, including "tsee see see", as well as a soft rippling trill which increases in volume. The Red-tailed Vanga's calls are as variable as is its song; both sexes utter a wooden call described as "tk-tk trrt" or "trrk tikatik", repeated many times, and the males emit a hissing "kschrrr".

Rufous, Helmet and Sickle-billed Vangas have distinctive calls. The call of the Rufous Vanga consists of three different notes, sounding like "kwa kwa kwoo" on a falling scale, and penetrating deep into the forest. When a taped recording of the call is played back, many birds, of several species, approach the recorder and gather around in the vicinity. These include Madagascar Paradise-flycatchers (*Terpsiphone mutata*), Common Newtonias and Common Tetrakas (*Bernieria madagascariensis*), as well as Rufous Vangas. The Rufous Vanga, being the dominant species within mixed flocks, is usually the first to sound the alarm whenever a predator appears in the vicinity, when it makes a loud chirping noise. The alarm call, very similar to that of the Helmet Vanga, attracts many other birds, which join in the mobbing of the predator. Both species also produce a soft drumming sound by clicking the mandibles. The Sickle-billed Vanga, on the other hand, utters a noisy "ga ga ga" when it encounters a predator. This alarm call, likewise, attracts many birds to the scene.

Food and Feeding

The members of this family are primarily insectivorous, although they take some vertebrate prey, and a few species consume a small amount of fruit. Vangas feed mainly on small and medium-sized insects, including beetles (Coleoptera), cockroaches (Blattodea) and Orthoptera, as well as caterpillars. Some supplement this diet with worms (Annelida) or spiders (Araneae), and most of them also take small vertebrates, especially small and medium-sized chameleons and geckos (Gekkonidae). In addition, Hook-billed Vangas prey on frogs, small birds, bird eggs and even young *Microcebus* lemurs. Chabert and Blue Vangas consume some vegetable matter, primarily, it seems, in the form of berries, and the White-headed Vanga occasionally takes some fruits or seeds. The Helmet Vanga, one of the large species, with



The bill shapes and foraging behaviour of the different vanga species resemble those of shrikes, tits, nuthatches, treecreepers and flycatchers, among others. The techniques used by Xenopirostris *vangas, such as **Lafresnaye's Vanga**, include woodpecker-like probing, using the stout, laterally compressed bill to search methodically in crevices and underneath bark in dead and broken wood. As a family, the vangas exploit all strata of the forest, including, occasionally, the ground. Lafresnaye's Vangas forage at middle and lower levels, often close to the forest floor. Usually seen alone or in pairs, they occasionally forage in groups of up to eight individuals, and often join other large vangas in mixed-species flocks.*

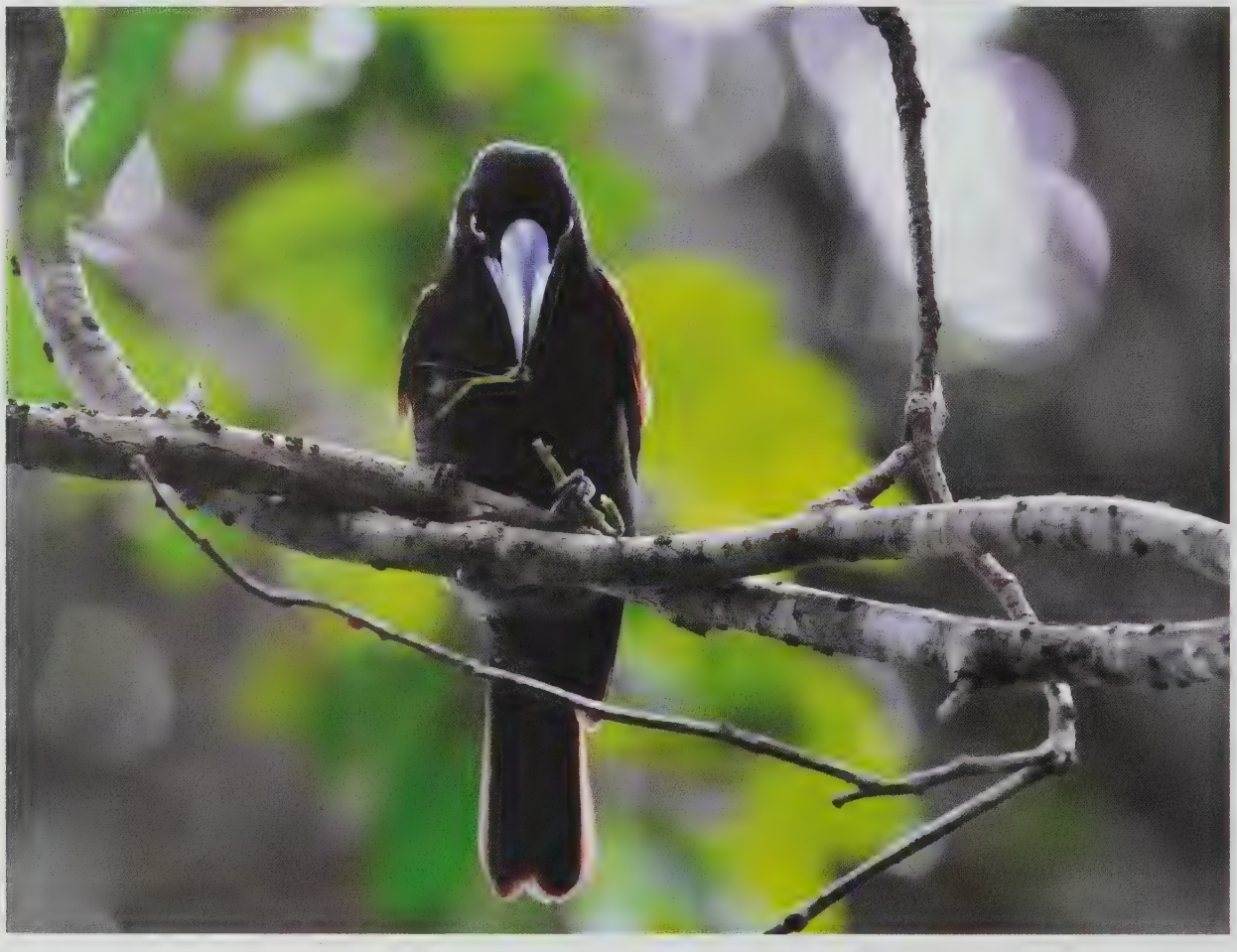
[*Xenopirostris xenopirostris*, Ifaty, Madagascar. Photo: Nick Garbutt/ Indri Images]



Using the analogy of gripping tools, if some vangas have bills like different kinds of pliers, one species has a pair of forceps. The ***Sickle-billed Vanga*** *uses its long, slender, curved bill to extract insect larvae from holes or crevices in trees, suggesting that this species is a true vicariant for woodpeckers (Picidae), which are absent from Madagascar. However, neither this species nor any other in Madagascar has adaptations for boring through timber and probing the exposed tunnels to catch retreating larvae. The Sickle-billed Vanga generally favours large branches, living or dead, for foraging, and in addition to probing, uses its bill to lever off bark, and to glean insects from various surfaces. Prey includes spiders, cockroaches, crickets and grasshoppers, beetles, worms and small vertebrates such as geckos and chameleons. A gregarious species, in the non-breeding season in particular, the Sickle-billed Vanga may be found in flocks of 20–30 or more, although, when not calling, a feeding group can be remarkably inconspicuous. At night, Sickle-billed Vangas gather in large communal roosts, which can contain more than 50 individuals. From mid-October to early December, the number of birds at the roost decreases as breeding pairs leave to build their nests. The non-breeding birds that remain will forage together in a group over a large area. From mid-December onwards, the number of individuals at the roost increases rapidly again, being augmented by an influx of non-breeding individuals and the juveniles which have fledged during the breeding season.*

[*Falculea palliata*, Ankarafantsika National Park, Madagascar. Photo: Pete Oxford/ naturepl.com]





Like heavy-duty pliers for gripping large, awkward objects, the bill of the ***Helmet Vanga*** *enables it to cope with large insects, and vertebrates like frogs, geckos and chameleons. Vangas generally dismember large, spiky or armoured prey items before swallowing them. The Hook-billed Vanga* (Vanga curvirostris) *wedges chameleons into a horizontal fork and pulls off the victim's limbs. Helmet Vangas and others secure large prey items with one or both feet and then use the bill to tear them into manageable pieces. Helmet Vangas forage in the middle level of forest, usually perching 3–10 m from the ground, and often remaining motionless for long periods. Five main foraging techniques have been recognized as being employed by Vangidae. These are gleaning, hovering, probing, snatching and hawking. About 80% of observed Helmet Vanga foraging motions involved snatching, or jumping onto still prey and seizing it from the substrate, including the ground, and 20% were gleaning. Helmet, Hook-billed and Rufous Vangas* (Schetba rufa) *use snatching to a greater extent than other vanga species, and more frequently take non-insect prey, such as lizards and chameleons. It is thought that snatching is a relatively recent development among vangas, and that the ancestor of the Vangidae was probably an insectivorous bird with a generalized bill shape suited to gleaning.*

[*Euryceros prevostii*, Masoala National Park, Madagascar.
Photos: Ketil Knudsen]

an exceptionally deep bill, consumes such insects as cockroaches, butterflies and moths (Lepidoptera), crickets and katydids (Tettigoniidae) and beetles, as well as frogs, geckos, chameleons and lizards. The smaller Tylas Vanga eats, among other items, snails (Gastropoda), spiders and butterflies, in addition to caterpillars, dragonflies (Odonata), horseflies (Tabanidae) and other Diptera, and grasshoppers (Acrididae).

Large prey items are generally dismembered before being swallowed. The Hook-billed Vanga, for instance, wedges chameleons into a horizontal fork and pulls off the victim's limbs, and the Sickle-billed and White-headed Vangas secure large prey with one or both feet and then use the bill to dismember the item.

Vangids exploit most levels of the vegetation. Red-tailed Vangas frequent all strata of the forest; they tend to head upwards towards the upper level, as they favour small branches for their hunting. The Tylas Vanga feeds in the canopy and the upper shrub layer, often seizing prey on the wing. Of all members of the family, the Rufous Vanga is the one most inclined to feed on the ground. This species is a classic sit-and-wait predator, capturing its food typically by snatching, hovering or hawking. Not uncommonly it drops to the ground, where it hops around while searching for food. It tends to fly only infrequently, and then only for relatively short distances. White-headed Vangas very occasionally descend to the ground, and the Helmet Vanga sometimes snatches prey from the ground.

Five main types of foraging technique have been recognized as being employed by the Vangidae. These are gleaning, hovering, probing, snatching, and hawking. Hovering involves the catching of motionless prey while hovering close to it, and snatching involves jumping on to still prey and snatching it from the substrate. Hawking is the seizing of aerial prey while in flight. In the case of hawking, the foraging height is related to the height of the perch from which sallies are made.

The members of the phylogenetic groups 1 and 2 (see Systematics), respectively the Tylas Vanga and the Nuthatch Vanga, employ primarily the gleaning technique. Those in group 3, the Chabert Vanga and the Common Newtonia, the latter currently treated as a sylviid warbler (see Systematics), use various techniques in almost equal proportions. Group 4 species, the Sickle-billed, White-headed, Bernier's and Van Dam's Vangas, utilize probing techniques that involve poking and winkling out, as practised by many woodpeckers. Among the species in group 5, namely the Blue, Red-tailed, Hook-billed, Helmet and Rufous Vangas, which were the earliest to become differentiated, the Red-tailed Vanga forages primarily by gleaning, while in the case of the Blue Vanga the suggestion of a snatching technique is evident. It seems that the later the time of differentiation, the greater the utilization of snatching techniques. The Hook-billed, Rufous and Helmet Vangas, which were the last species to become differentiated, use snatching to a greater extent, and more frequently take non-insect prey, such as lizards and chameleons, than do the other species. Consideration of foraging techniques leads to the suggestion that the probing behaviour has evolved in group 4. Thus, the phylogenetic groups within the family reflect the foraging habits of the species, rather than the type of bill shape.

Another interesting insight may be gained by comparing this proposed phylogeny with the findings on foraging behaviour. All species of vanga capture prey by pouncing and picking: they pounce on sedentary prey items and pick them up. Although the extent to which they use the various techniques varies from one species to another, all members of the family capture prey by gleaning. Moreover, it seems that the older the lineage is, the higher is the frequency of gleaning when prey-catching. Since vangas subsist mainly on insects, the ancestor of the family was probably an insectivorous bird with a generalized bill shape suited to gleaning.

In Madagascar, the original absence of some terrestrial birds appears to have left various ecological niches vacant and thus available to the Vangidae. The rapid diversification of vangas is most likely to have occurred following the utilization of vacant niches normally occupied elsewhere in the world by other families. For example, the Sickle-billed Vanga uses its long, slender and curved bill as a means of extracting insect larvae from holes or crevices in trees, suggesting that this species is a true vicariant for woodpeckers. Even with this species, however, the niche filled usually by woodpeckers, with special adaptations for boring through timber and for probing the exposed tunnel to catch the retreating insect larvae, is not completely occupied in Madagascar. It seems that the various vangid species in group 4 (see Systematics) are each partially taking on the role of woodpeckers.



*The **White-headed Vanga** searches for food items on branches of all sizes, even near-vertical ones. Like the smaller Blue Vanga* (Cyanolanius madagascarinus), *it often hangs upside-down. Large prey is typically dismembered with the bill while it is held down with a foot. The main foraging techniques employed by this species are snatching and gleaning. Like other species of its lineage, it uses probing techniques involving poking and winkling out, as practised by many woodpeckers (Picidae). It uses its stout, conical bill to investigate insect refuges under peeling bark and epiphytes, occasionally removing bark fragments. It also breaks open dead twigs. A sociable species, it is often seen in mixed feeding flocks with other vangas.*

[*Artamella viridis annae*, Ampijoroa, Madagascar. Photo: Ketil Knudsen]



*The small and agile **Blue Vanga** often feeds while hanging upside-down, in leaf clusters near the ends of thin branches. Madagascar has no tit (Paridae) species, and among the Blue Vanga's adaptations to occupy this niche is a much finer bill than the larger members of the family. In Madagascar its prey consists of insects, including beetles and caterpillars, while spiders have also been recorded in the Comoros. The Blue Vanga is one of the few vanga species known regularly to take plant food, particularly berries. Again rather like tits, and unlike most vangas, which are normally seen alone or in pairs, this species forages in groups of up to six individuals. Like other vangas, outside the breeding season it is commonly found in mixed-species flocks.*

[*Cyanolanius madagascarinus madagascarinus*, Ankarana Special Reserve, Madagascar.
Photo: Pete Oxford/ naturepl.com]



*The female **Sickle-billed Vanga** takes the lead in courtship. On meeting a male, she adopts a horizontal posture, and quivers her wing and tail feathers. The male does not offer any display in return. Although most vangas are believed to be basically monogamous, several variations of co-operative breeding are found within the family. Male Sickle-billed Vangas participate in territorial defence and anti-predator defence, as well as less regularly with nest-building, incubation, and the brooding and rearing of the chicks.*

[*Falculea palliata*, Ankarafantsika National Park, Madagascar. Photo: Clifford & Dawn Frith]

The Nuthatch Vanga is a gleaning specialist. It climbs medium-sized and large tree trunks in the manner of a nuthatch, searching for invertebrates on the bark, and occasionally foraging along horizontal branches. It sometimes climbs relatively narrow stems or even lianas. Bernier's Vanga regularly strips moss and bark from trees and is able to cling to almost vertical trunks in woodpecker fashion. The small and agile Blue Vanga often forages in leaf clusters near the ends of branches while suspended, upside-down, by its feet, and the medium-sized White-headed Vanga likewise often hangs upside-down in order to reach food items.

With the exception of the Sickle-billed and Rufous Vangas, the members of this family are generally not gregarious. The majority of the species tend to forage alone or in pairs, or in small family parties. However, vangas are often to be seen in mixed foraging flocks (see General Habits). Indeed, such flocks are often led by a vanga species and not infrequently contain more than one vangid. As an example, the Tylas Vanga is found with other vangas in mixed-species feeding flocks which contain, among others, Madagascar Cuckoo-shrikes, Common Tetrakas, Madagascar Black Bulbuls (*Hypsipetes madagascariensis*) and Common Newtonias. These non-vangid associates are commonly observed in other vanga-led flocks, as also are Malagasy White-eyes (*Zosterops maderaspatanus*), Madagascar Paradise-flycatchers and Long-billed Green Sunbirds (*Cinnyris notatus*). Red-tailed Vangas forage in mixed-species flocks that sometimes include other vangas, but often include small forest passerines such as Common (*Neomixis tenella*) and Stripe-throated Jeries (*Neomixis striatigula*) and Sakalava Weavers (*Ploceus sakalava*) or larger species such as the Madagascar Crested Drongo (*Dicrurus forficatus*) and the Madagascar Cuckoo-shrike.

Breeding

Most vangas breed in the southern summer, starting in September or October and finishing in December or January, with some latitudinal and altitudinal variations. Only one breeding cycle is completed annually. If the first attempt fails, however, the pair will usually make a second attempt. For populations of the Rufous, Hook-billed, Van Dam's, Sickle-billed, White-headed and Chabert Vangas found in Ankarafantsika National Park, in the north-western region of Madagascar, breeding commences from the end of September to mid-October, coinciding with the end of the dry season, and continues until the early or middle part of January, the middle of the rainy season. In Ranomafana National Park, in the humid south-eastern region of Madagascar, the Tylas, Red-tailed and Pollen's Vangas likewise begin breeding in September and continue until January.

*In all the vanga species that have been studied, both pair-members help make the nest. In the case of the **Rufous Vanga**, which builds a cup-shaped nest of moss, plant fibres and cobwebs in the fork of a tree, they are sometimes assisted by a third individual. Approximately 30% of breeding pairs of this species are accompanied by one or more yearlings or older males. Most vangas breed in the austral summer. Rufous and other vangas in Ankarafantsika National Park, in the north-west of Madagascar, commence breeding from the end of September to mid-October, coinciding with the end of the dry season, and continue until early or mid-January, in the middle of the rainy season.*



[*Schetba rufa rufa*, Masoala National Park, Madagascar. Photo: Ketil Knudsen]





*The materials and structure of the nest built by the **Sickle-billed Vanga** are quite different from those of other vanga species. A large, untidy, bowl-shaped construction of smooth or thorny twigs is constructed 9–16 m up, usually in the fork of a tree. The materials used by different species usually reflect the habitat and availability of plant matter, from moss in humid rainforests to dry leaves in sub-arid scrub and dry forest. Within the open framework of the Sickle-billed Vanga's nest, the interior is lined with more delicate material, such as plant fibres. Spiders' webs are commonly used by most vangas to reinforce and secure the nest materials. Vangas lay between two and four eggs. The Sickle-billed Vanga's clutch is of three to four creamy white eggs, heavily mottled with grey, violet-grey or maroon; as with other species, markings tend to be denser at the larger end of the egg.*

[*Falculea palliata.*

Above: Ampijoroa, Madagascar.
Photo: Ketil Knudsen.

Below: Ankarafantsika National Park, Madagascar.
Photo: Clifford & Dawn Frith]



The three Xenopirostris *species and the* ***Chabert Vanga*** *employ advanced nest-building techniques, such as weaving plant fibres into a small, neat basket shape, secured with spiders' web. Rather than being wedged into a fork like most vanga nests, the nest is often anchored firmly to a horizontal branch. The site may be 6–19 m above the ground. Brief observations of additional birds assisting with nest construction or attending the nest suggest that the Chabert Vanga may be a co-operative breeder; the age and relationship of the helpers is unknown. While "helping" may prove to be widespread among vanga species, there are some, like the Helmet Vanga* (Euryceros prevostii), *in which the basic breeding unit appears to be the unassisted pair.*

[*Leptopterus chabert schistocercus*, Tulear, Madagascar. Photo: Pete Morris]

Few details of the courtship of vangas have been documented. Perhaps the most interesting is that of the Sickle-billed Vanga. With this species, it seems that the female does the courting of the male, rather than the reverse. On meeting a male, the female Sickle-billed Vanga approaches him, and adopts a posture with the body held horizontal, and then proceeds to quiver the feathers of both wings and the tail feathers in what is evidently a courtship display. The male, meanwhile, does not offer any display in return. It is interesting to note that, unlike most other bird species, the Sickle-billed Vanga continues to display and to copulate until after the eggs have hatched and well into the brood-rearing stage of the breeding cycle.

The breeding biology of most vangid species is poorly known. Indeed, for several species, there are descriptions of only one or two nests, or merely of nests still under construction.

In the case of the Red-tailed, Van Dam's, Pollen's, Sickle-billed, White-headed, Rufous, Helmet and Tylas Vangas, it is known that both the male and the female participate in the task of nest-building. There is no reason to believe that other vangas are different in this respect. Vangids have four basic types of nest. The first, a large bowl-shaped nest made from piles of twigs, like those of a *Streptopelia* dove or a *Corvus* crow, is constructed by the Sickle-billed Vanga; the Nuthatch Vanga collects piles of moss and places these in the hollow of a tree trunk; the third nest type, built by the Rufous, Hook-billed and Helmet Vangas, is a small, bowl-shaped structure placed in the fork of a tree; and the remaining species build a cup-shaped nest, the size and location of which vary. In the last category, the three *Xenopirostris* species and the Chabert Vanga employ advanced nest-building techniques, such as the weaving of plant fibres into a basket shape and anchoring the structure firmly on a horizontal branch. In contrast, some other species that build cup-shaped nests, such as the Tylas, Blue, Red-tailed and White-headed Vangas, suspend the nest from the end of a branch. The nesting materials used by the Sickle-billed Vanga and the Nuthatch Vanga are often very different from those utilized by other species, which also commonly make use of cobweb. The material used, however, usually reflects the habitat and the availability of various plant matter. For instance, the Nuthatch and Helmet Vangas, which inhabit humid rainforests, use plenty of moss in the construction, whereas the Sickle-billed and White-headed Vangas and the members of the genus *Xenopirostris*, which inhabit relatively dry open forest, use leaves and dry twigs for nest-building.

Clutches laid by the Vangidae contain two to four eggs, with some variation from one species to another. The eggs range in colour from white or pinkish-white to bluish-green, with markings ranging from red or reddish to grey or violet-grey or olive-brown; the markings can be small and sparse or dense, and they tend to be denser at the larger end of the egg.

In the case of the Rufous Vanga, incubation begins once the first egg has been laid, but the hatching pattern varies from complete asynchrony to complete synchrony. The male of this species contributes greatly towards the task of incubation from the moment when the first egg is laid, and he appears to lack any distinct mate-guarding behaviour during the laying period. In contrast, the male Sickle-billed Vanga guards the female throughout the egg-laying period, as well as during the week prior to it. The contribution of the female Rufous Vanga in incubation increases gradually during the egg-laying period until the clutch is complete; thereafter, the two partners share the duties of incubation almost equally. It is known that both sexes of the Red-tailed, Van Dam's, Pollen's, Sickle-billed, White-headed, Helmet and Tylas Vangas participate in incubation, and it is likely that the same applies also to other vangas.

Incubation periods of vangids range from 16 days to 19 days, but the Hook-billed Vanga's eggs require a longer period, about 22–24 days. The nestling periods are similar in duration to the incubation period, generally from 15 days to 19 days, but the chicks of the Hook-billed Vanga do not leave the nest until they are 20–22 days of age, while the fledging periods of the young Sickle-billed and White-headed Vangas are in the range 19–24 days.

Vangas are basically monogamous. Since not all breeding systems of vangas have been identified, however, it would be presumptuous to reach any definitive conclusions about this aspect of their life. Nevertheless, it is evident that considerable diversity exists within the family. The vangas exhibit several variations in the mode of co-operative breeding, leading to different breeding systems. Of the 15 species currently recognized, three have been the subject of studies relating to breeding biology and in which individual birds have been colour-ringed. These are



The incubation period of the ***Helmet Vanga*** *is unknown. In other vanga species it ranges from 14 to 19 days, with the established exception of the Hook-billed Vanga* (Vanga curvirostris), *which takes 22 to 24 days. The Helmet Vanga's clutch is of two to three eggs, and the breeding pair will share the task of incubation equally. In the Rufous Vanga* (Schetba rufa), *the four eggs are laid at a rate of one per day, and incubation begins with the first. However, the hatching pattern varies from complete asynchrony to complete synchrony. The male Rufous Vanga contributes greatly towards the task of incubation, from the moment the first egg is laid. The female's contribution to incubation increases gradually during the egg-laying period, until the clutch is complete; thereafter, the two partners share the duties of incubation almost equally. The "helpers" found attached to some breeding pairs of Rufous Vanga do not appear to help with incubation. In the Tylas Vanga* (Tylas eduardi), *a monogamous species which breeds as a simple pair, the female does most of the incubation of the eggs and brooding of the chicks. Among the polyandrous species, an immature Bernier's Vanga* (Oriolia bernieri) *which copulated with a female also assisted with nest-building and, to a minor extent, with incubation. In most co-operative polyandrous species, the males' role is usually restricted to feeding the young, but in the Sickle-billed Vanga* (Falculea palliata) *too the males help with incubation and brooding, although infrequently. Unlike most other bird species, Sickle-billed Vangas continue to display and to copulate until after the eggs have hatched, and well into the brood-rearing stage of the breeding cycle.*

[*Euryceros prevostii*, Marojejy National Park, Madagascar]
Photo: Nick Garbutt/ Indri Images]

the Rufous, Sickle-billed and White-headed Vangas, the first having yielded the most detailed information.

The most striking aspect of the breeding behaviour of the Rufous Vangas is the fact that it breeds in groups of three or four individuals, as well as in simple pairs. In several cases, one of the supplementary members has been seen to be in attendance at the nest. Approximately 30% of the breeding pairs of this species are accompanied by a yearling male or an older male as a helper at the nest. A majority of these are sons of the breeding pair which have remained within the natal territory. These helpers participate in such activities as the mobbing of predators, territorial defence, and the feeding of nestlings, and their assistance can account for up to 30% of the total brood-feeding activity at a given nest. The degree of assistance with the feeding of the young, however, varies greatly among individuals. In fact, about half of these auxiliaries will play no part at all in the process of chick-feeding. The presence or absence of a helper, and whether or not that helper assists, appear not to affect the reproductive output of the pair.

White-headed Vangas breed as simple pairs, but this species, too, occasionally has a helper. In this case, however, the helper is a moulting male and is unable to provide food for the young. Instead, the immature moulting males contribute to the breeding efforts of the pair by participating in territorial defence and the mobbing of predators. The helper is involved in a close social relationship with the pair-members through preening activities. Helpers at Rufous Vanga nests do not undergo wing moult while they participate in the feeding of the nestlings. The co-operative breeding pattern of the White-headed Vanga, therefore, lags a step behind that of the Rufous Vanga. At Ampijoroa, in north-west Madagascar, an individual Blue Vanga which had not yet completed its moult was found in the company of a breeding pair. It is possible that this species has a breeding system similar to that of the White-headed Vanga.

The "helping" behaviour demonstrated by the Rufous and White-headed Vangas may be more widespread among the vangas, as brief observations of unmarked individuals attending the nest or assisting with nest construction have been reported for other species, the Chabert and Bernier's Vangas being examples. On the other hand, no helping behaviour has been observed at nests of the Helmet, Hook-billed, Van Dam's, Pollen's and Tylas Vangas. With these species, the basic breeding unit is a pair, and the sexes contribute equally to incubation and the feeding of young.

Sickle-billed and Bernier's Vangas breed in groups which consist of a single female and several males. The Rufous Vanga falls into the same category. In the Sickle-billed and Bernier's Vangas, however, a number of different males copulate with a single female. These are breeding males, not helpers, and the breeding system is that of co-operative polyandry. Although, in co-operative polyandrous species, the male's contribution is normally solely that of feeding the young, the male Sickle-billed Vanga assists with nest-building, the incubation of the eggs and the rearing of the chicks.

For those vangids for which sufficient data are available, breeding success is generally low. For example, only 25–33% of Rufous Vanga breeding pairs succeed in rearing the young to the fledging stage. At most failed nests, the entire clutch of eggs or the entire brood of nestlings disappeared at the same time, suggesting that they were taken by such nest predators as snakes, lizards, lemurs and hawks, at least in the cases of the Rufous, White-headed and Sickle-billed Vangas.

Almost nothing is known about the extent of the predation suffered by vangas. Furthermore, basic information on nesting biology, territory size, social behaviour, and other aspects of the breeding cycle remain unknown for most memers of this family.

Movements

So far as is known, the vangas are not migratory and have never been reported from the African continent. Although it was once claimed that the Blue Vanga disappeared from the broadleaf forest of the western part of Madagascar during the dry season, this is evidently not the case. Indeed, individuals of every species known locally have been observed in both the breeding and the non-breeding seasons.

Breeding pairs of Rufous Vangas in Ankarafantsika, in north-west Madagascar, were ringed and then monitored. It was found that males and females were sedentary throughout the year and held stable territories. In the same locality, seven ringed White-headed Vangas, comprising five males and two females, bred from November to December; three of the males and one female were observed in the same territories in the following year. Some Sickle-billed Vangas ringed in Ankarafantsika were sedentary, and bred in the same sites for several years. They were obviously residents, occupying the same habitat throughout the year, and seldom moving long distances.

Detailed studies of the presumed short-distance movements of vangids are needed urgently in order to develop conservation measures for the endangered species (see Status and Conservation).

Relationship with Man

Local people are obviously aware of the presence of vangas in the forests of Madagascar. Colloquial names for vangas are many and are fairly constant throughout the region, suggesting that there is some common knowledge of the species. The names of some members of this family are rooted in the life of people. As an example, the Sickle-billed Vanga noisily calls "ga-ga", but occasionally utters "kwa-kwa", like a crow. In Malagasy, this bird is referred to by the name Voronjaza, meaning a "bird of the children". It is so named because of the perceived similarity between its "kwa-kwa" call and the crying of an infant.

The Malagasy names of vangas are derived from their songs, their plumage colour or their behaviour. Vangasoratra means "the



Helpers—male offspring from earlier years—can account for up to 30% of the total brood-feeding activity at a given ***Rufous Vanga*** *nest. The degree of assistance with feeding the young, however, varies greatly among individuals. About half the helpers make no contribution at all, restricting their role to mobbing predators and defending the territory. Helpers at Rufous Vanga nests do not undergo wing moult while they participate in feeding the nestlings, whereas the occasional single helper found at White-headed Vanga* (Artamella viridis) *nests is a moulting male; it is unable to contribute to feeding the young. The presence or absence of a helper, and whether or not that helper assists, appears not to affect the reproductive output of the Rufous Vanga pair. The male and female hold their territory throughout the year, and the location of territories remains the same in successive years.*

[*Schetba rufa occidentalis*, Western Dry Forest, Madagascar. Photo: Pete Oxford/ naturepl.com]



*The male and female of **Pollen's Vanga** participate equally in the brooding and feeding of their young. This is a female, distinguishable by the blackish hood extending only to the chin and throat, not onto the upper breast, and by the combination of a white band below the hood, under which the breast is variably tinged orange. At the change-over, the arriving bird calls to alert the brooding bird, which departs immediately. There is little information on the diet of vanga nestlings. In observations of one Pollen's Vanga nest, food brought included crickets, a caterpillar, unidentified insects, and a chrysalis which was eaten by the female after being offered.*

[*Xenopirostris polleni*, Ranomafana National Park, Madagascar. Photo: Nick Garbutt/ Indri Images]

black-and-white bird", and is applied to the Hook-billed Vanga, while the Nuthatch Vanga's local name, Voronakodidina, means "bird turning and climbing around the tree". Totokarasoka, the Red-tailed Vanga, may be derived from its song, transcribed as "toto toto karasoka, toto toto kasaroka". The local people know all species of vanga except the Red-shouldered Vanga, which was only recently described from a small area of unprotected forest in south-western Madagascar.

This distinctive family is still relatively poorly known, even though it is of great interest to birdwatchers. It is true to say that, in Madagascar's growing ecotourism industry, vangas play a leading role as symbols of the uniqueness of the island's animal life.

Status and Conservation

Vangas are found throughout the wooded habitats of Madagascar. Most species are widely distributed and often are fairly common in suitable habitats, although, at the local scale, some are inexplicably scarce or absent. One member of the family, the Blue Vanga, occurs also in the Comoro Islands, where it is not uncommon in wooded parts of Mohéli and appears to be extremely rare on Grand Comoro.

The main threat to vangas is the clearing of forests. Since the early 1950s, Madagascar has lost about half of its forest cover, including most of its coastal lowland forests, which have been reduced by about 90%. All of the remaining native forests are under heavy pressure for conversion to agricultural land. Almost all of them are on relatively poor soil, and, once the forest is cleared, the soil nutrients disappear quickly; as a consequence, farmers are forced to move to another patch of fresh forest after only a few seasons of cultivation. This kind of slash-and-burn cultivation, known in Madagascar as *tavy*, would, if allowed to continue uncontrolled, ultimately remove about 95% of the endemic fauna and flora, including all forest-dependent species. Additional adverse factors are uncontrolled bushfires, commercial logging, and exploitation of timber for charcoal and firewood. The conservation of forests is, therefore, essential for the survival of most of Madagascar's endemic birds, including vangas.

Of the 15 species of vanga currently recognized, four are globally threatened and one is placed in the category of Near-threatened. Two of the threatened species have an extremely limited geographical range. Van Dam's Vanga, listed as Endangered, has been recorded in recent decades only at two widely separated localities, Ankarafantsika National Park and Analamerana Special Reserve, in north-west and north Madagascar. Although both of these are officially protected areas, there is no certainty that they will remain so in the future. Western forests are disappearing at an extremely fast rate, and many smaller forest blocks which were intact or little disturbed in the 1980s and early 1990s are now devoid of forest-specialist birds. The fact that the western forest is already so fragmented and is now under great pressure means that it is probably the most threatened forest ecosystem in Madagascar. Van Dam's Vanga is still locally common in suitable habitats, although, in Ankarafantsika, these are limited to patches of forest.

The second threatened vangid with a tiny global range is the Red-shouldered Vanga, a recently described species which is known only from a small area of unprotected forest in the Toliara region, in south-western Madagascar. This poorly known vanga appears to have a very small population, and is therefore classified as Vulnerable. The Red-shouldered Vanga was described as a new species in 1997, on the basis of two specimens collected 50 years earlier, in 1947. It was photographed in the wild in 1992, and in July 1997 about nine males were observed in the same area, on the road between La Table and St Augustin; these were in an area of suitable habitat extending over about 30 km^2, suggesting a possible population of 30–100 pairs. Farther south, the species has been found at several places on the Mahafaly Plateau, including Hatokaliotsy and Tsimanampetsotsa, but at an apparently low density. At the start of the twenty-first century, this species was located at Linta, some 50 km south of its previous known limit, and suitable habitat exists farther south of this site. Currently, the Red-shouldered Vanga's habitat is becoming degraded in patches, where it is subject to shrub clearance for charcoal and is being grazed by goats; timber extraction is a fur-





The nestling period of the ***Red-tailed Vanga*** *is around 16 days, during which both parents brood and feed the young. The nestling periods of vanga species in general are similar in duration to the incubation periods, usually ranging from 15 to 19 days. As with its longer incubation period, the Hook-billed Vanga* (Vanga curvirostris) *is again an exception, with a nestling period of up to 22 days; in the cases of Sickle-billed* (Falculea palliata) *and White-headed Vangas* (Artamella viridis), *it lasts up to 24 days. In those vangas for which sufficient data are available to make assessments, breeding success is generally low. For example, only 25–33% of Rufous Vanga* (Schetba rufa) *breeding pairs succeeded in rearing the young to the fledging stage. At most failed nests, the entire clutch of eggs or the entire brood of nestlings disappeared at the same time, suggesting that they were taken by nest predators, which might have been snakes, lizards, lemurs or raptors. However, almost nothing is known about the extent of predation suffered by vangas. If a first breeding attempt fails, the vanga pair will usually make a second attempt. Only one breeding cycle is completed annually.*

[*Calicalicus madagascariensis*, Ranomafana National Park, Madagascar. Photos: Dominique Halleux/ Bios]



*Most of the 15 vanga species are widely distributed, and are often fairly common in suitable habitat, but seven, including **Pollen's Vanga**, have restricted ranges. Confined to undisturbed primary forest in the East Malagasy Wet Forests Endemic Bird Area (EBA), Pollen's Vanga is commoner in the south of its range than in the north, where it is scarce or apparently absent from some seemingly suitable habitats. The lowland parts of its habitat in particular are at risk from logging and slash-and-burn agriculture, and if present trends continue, will disappear altogether within a few decades. Its population is already believed to be small, and the species is currently listed as Near-threatened.*

[*Xenopirostris polleni*, Ranomafana National Park, Madagascar.
Photo: Ketil Knudsen]

ther problem at some sites. Nevertheless, much suitable habitat remains intact, as the soil is unsuitable for agriculture and the area is inhabited predominantly by fishermen and goat-herders. This situation could change, however, if people with different farming techniques move in to the area. If the Red-shouldered Vanga's habitat does become threatened and a population decline is recorded, the species' conservation category could be upgraded to that of Endangered.

Bernier's Vanga and the Helmet Vanga are the two other Vulnerable members of the family. Both are confined to the northern half of the eastern rainforest belt, in north-east Madagascar. Bernier's Vanga has been recorded at many sites from Marojejy south to Zahamena, and there is a single, as yet unconfirmed record from much farther south, in Vondrozo. This vanga, which is restricted to undisturbed humid evergreen forest, seems to be scarce and patchily distributed throughout its range. The Helmet Vanga is patchily distributed from Tsaratanana south to Mantadia, and has been recorded only in primary forest, generally below 800 m. It is uncommon throughout its range. Both of these vangids are considered to be at risk because their forest habitat, already severely fragmented, continues to disappear at a fast rate, leading to concomitant decreases in their populations. Like all forests in Madagascar, primary lowland rainforest is threatened mainly by slash-and-burn cultivation, which results in progressively more degraded regrowth and, finally, grassland or bracken-covered areas. Much of the coastal plain in east Madagascar has already been cleared, and many tracts which have not been cleared contain only highly degraded forest. The surviving areas of forest are under pressure from an increasing human population, and in some areas commercial logging poses a further threat. It is considered very likely that, if current trends continue, virtually all of the remaining forest, especially that at lower elevations, will have disappeared within a few decades.

Several protected areas exist within the north-eastern rainfororest belt. Both of these species are present in Marojejy National Park, Masoala National Park and Zahamena National Park, in Ambatovaky and Anjanaharibe-South Special Reserves, in Betampona Strict Reserve, and in Anjanaharibe, Bezavona and Haute Rantabe Classified Forests. Bernier's Vanga occurs also in Mangerivola Special Reserve, and the Helmet Vanga in Mantadia National Park and Tsaratanana Strict Reserve. Effective protection of the national parks is considered to be of particular importance, as these still contain significant areas of good-quality habitat.

Pollen's Vanga is another inhabitant of the primary humid evergreen forest of eastern Madagascar. Unlike the two aforementioned species, however, it is distributed through most of the length of this habitat. Significantly, it is more common in the south of its range, between Ranomafana and Andohahela, than it is in the seemingly suitable habitat in the northern part of the island, where, in common with Bernier's and Helmet Vangas, it is only patchily distributed and is scarce or apparently absent locally. Pollen's Vanga is believed to have a moderately small population which, owing to forest clearance and degradation, is thought likely to suffer a decline over the next decade or so. It is classified as Near-threatened. If it is found that this species has a small population, or that it is undergoing a rapid decline in numbers, this may be considered grounds for placing it in a higher threat category, that of Vulnerable.

The Tylas Vanga is common in the south-eastern rainforest. There is, however, considerable uncertainty with regard to the status and distribution of its western race, *albigularis*, which is known only from a very few sightings in western Madagascar and appears to be extremely rare. It has been recorded in the areas of Morondava, Morombe and Ankazoabo, and, farther north, at Baly, which lies about 120 km south-west of Mahajanga, but it is possible that it occurs elsewhere, too. On the other hand, fieldwork by a number of independent observers in western Madagascar has failed to produce any further locations for this taxon.

Mystery surrounds the status of what has been called "Bluntschli's Vanga", described on the basis of two apparently juvenile specimens from near Tôlanaro, in south-east Madagascar (see Systematics). This is sometimes treated as a genuine species, albeit an extremely rare and almost unknown one. It is possible that since 1931, when the two specimens were collected, the taxon has for some reason become extinct, although there is still forest of adequate quality at the single locality where they were found. In 1995, a survey of the fauna of Andohahela was undertaken, and this included forest near this same site, but only the Nuthatch Vanga was found. BirdLife International currently treats "Bluntschli's Vanga" as a Data-deficient species. If it does prove to be a valid species, it would surely be listed as Criti-



Four vanga species are globally threatened, and of these, two have very small ranges. The Vulnerable ***Red-shouldered Vanga*** *was described as recently as in 1997, from two specimens collected 50 years earlier near Toliara, in south-west Madagascar. In 1997, nine males were located in the same area, in an area of dense* Euphorbia *scrub covering some 30 km², suggesting a possible population of 30–100 pairs. It has subsequently been found at sites further south, but at low density. Its habitat is being irregularly degraded by shrub clearance for charcoal and grazing by goats, although much of what remains is still intact because the soil is unsuitable for agriculture.*

[*Calicalicus rufocarpalis*, Tulear, Madagascar. Photo: Pete Morris]

cally Endangered, as it clearly would have a tiny population and total range.

Only one member of the family has a range extending beyond Madagascar. This is the Blue Vanga, which occurs on two of the nearby Comoro Islands. The subspecies *comorensis* is fairly common on Mohéli, where it inhabits wooded areas at elevations of up to 300 m. The highest point of the island is little more than 700 m. In contrast, the Blue Vanga is extremely rare on Grand Comoro, where it was first sighted in June–July 1974. Since then, only two other confirmed sightings have been made, both in August 1981 and at an altitude of approximately 900 m. The Grand Comoro Blue Vanga represents a separate race of this species, *bensoni* (see Systematics).



Listed as Endangered, ***Van Dam's Vanga*** *is the most threatened species in the family.It is currently known only from two widely separated sites of dry deciduous forest in north-west Madagascar. Although both sites are officially protected, they are being reduced by clearance and bushfires, and their future is not secure. Nevertheless, there is suitable habitat between these sites that has not yet been thoroughly surveyed. Loss of habitat may be the main threat to vangas, but lack of information is the main handicap to developing conservation strategies, and many more studies of this family are needed.*

[*Xenopirostris damii*, Ankarafantsika National Park, Madagascar. Photo: Ian Merrill]

In order to conserve all species of vanga, it is essential that many more scientific studies be conducted with the aim of determining each species' precise habitat requirements, population size, dispersal pattern and reproductive output, as well as the causes of mortality. Such information will be indispensable with regard to the establishment of detailed conservation strategies. Madagascar has many forest reserves, and it is hoped that, as conservation programmes are implemented, the pressure on them may gradually be eased. The rate of forest clearance outside the protected areas, however, is still high, exerting renewed threats of commercial logging. Increased public awareness of environmental matters and of the importance of conserving the fauna and flora of such unique places as Madagascar is a vital ingredient in the conservation process. In the Comoros, Mohéli is the least disturbed of the four islands and has the smallest human population. Much of its original habitat remains. Grand Comoro, on the other hand, is highly disturbed and is threatened by further destruction and degradation of its native habitat.

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PLATE 8

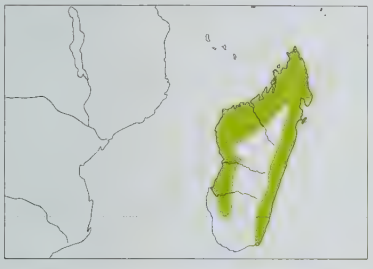
Genus *CALICALICUS* Bonaparte, 1854

1. Red-tailed Vanga

Calicalicus madagascariensis

French: Calicalic malgache **German**: Rotschwanzvanga **Spanish**: Vanga Colirrojo
Other common names: Red-tailed Shrike

Taxonomy. *Lanius madagascariensis* Linnaeus, 1766, Fort Dauphin (Tôlanaro), south-east Madagascar.
Recent molecular-genetic analysis indicates that genus may be closest to *Vanga*, *Cyanolanius*, *Schetba* and *Euryceros*; recent cladistic analysis based on morphological characters, however, suggests that it may not belong in the present family, but could be closer to drongos (Dicruridae) and monarch-flycatchers (Monarchidae). Monotypic.
Distribution. N, W & E Madagascar.



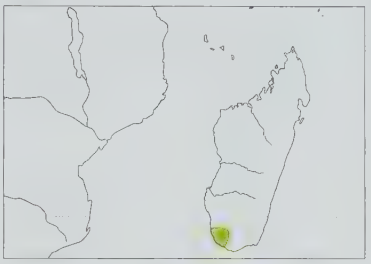
Descriptive notes. 13–14 cm; 14–18·6 g. A small vanga reminiscent of a tit (Paridae). Male has grey forehead to nape, black patch from base of bill extending backwards broadly around eye and with narrow white border above; upperparts grey, slightly tinged green, except for rufous rump and uppertail-coverts; upperwing green-grey, median and lesser upperwing-coverts rufous, primaries blackish with grey fringes; tail rufous, inner webs of central feather pair grey-brown; white cheek and ear-coverts, contrasting black chin and throat; underparts whitish, side of chest and flanks washed light tan, thighs often washed rufous; underwing-coverts white; iris dark brown; bill black; legs grey. Female has forehead to nape duller grey, conspicuous off-white eyering, upperparts olive-brown, rump and uppertail-coverts brick-red, upperwing dark brown, tail feathers brick-red with dark brown inner webs; lower ear-coverts, cheek and side of neck buffy, throat whitish, broad buffy breastband, grading to whitish on belly; bare parts as for male. Juvenile is similar to female, but has buff shaft streaks and tips on underpart feathers. Voice. In N & E, male sings "per-whew" with falling intonation (sounding like a human wolf-whistle); in W, male typically sings "pew-poo-whee" or "oo-oo-whi", last syllable higher; also a different song heard in W (near Morondava) was transcribed as "plee-plee tick-che-weh". Calls equally variable; both sexes utter wooden-sounding "tk-tk trrk" or "trrk tikatik", repeated many times, and male also gives hissing "kschrrr". Male calls often during foraging.
Habitat. Native forest of various types, including adjacent second growth; generally absent from sub-arid scrub. Sea-level to 2000 m.
Food and Feeding. Small and medium-sized insects, including Orthoptera, beetles (Coleoptera), caterpillars; also small vertebrates, mainly chameleons (of genus *Chamaeleo*). Frequents all levels of forest; tends to move towards upper level, as it prefers small branches for foraging. Gleans prey from branches; in one study, more than 90% of foraging manoeuvres involved gleaning. Generally in pairs during breeding season, sometimes in small groups; often within mixed-species flocks that may include other vangas, but often also include such small forest passerines as Common Jery (*Neomixis tenella*), Stripe-throated Jery (*Neomixis striatigula*) and Sakalava Weaver (*Ploceus sakalava*), or such larger species as Madagascar Crested Drongo (*Dicrurus forficatus*) and Madagascar Cuckoo-shrike (*Coracina cinerea*).
Breeding. Season Oct–Jan in E (Ranomafana). Monogamous. Nest built by both sexes, an open cup made from interwoven leaf stalks reinforced with spider webs, no special interior lining, usually high above ground (near treetop) in fork of tree. Clutch 2 eggs, green-blue with widely scattered chestnut and reddish-grey small spots increasing in density at larger end; incubation by both sexes, period c. 16 days; both also brood and feed chicks, nestling period c. 16 days.
Movements. Probably sedentary.
Status and Conservation. Not globally threatened. Common to fairly common. The commonest vanga in E Madagascar; fairly common in N of range; more patchily distributed in W. Occurs in several protected areas, e.g. common in Mantadia Andasibe National Park, Ranomafana National Park and Zombitse-Vohibasia National Park.
Bibliography. Appert (1968a, 1970), Dee (1986), Goodman, Hawkins & Domergue (1997), Hartlaub (1861, 1877), Langrand (1990), Milon *et al.* (1973), Morris & Hawkins (1998), Rakotomanana *et al.* (2009), Schulenberg (2003), Sinclair & Langrand (1998), Yamagishi & Eguchi (1996).

2. Red-shouldered Vanga

Calicalicus rufocarpalis

French: Calicalic à épaulettes **German**: Rotschultervanga **Spanish**: Vanga Hombrorrojo

Taxonomy. *Calicalicus rufocarpalis* Goodman, Hawkins and Domergue, 1997, Tuléar [= Toliara], Toliara Province, south-west Madagascar.
Recent molecular-genetic analysis indicates that genus may be closest to *Vanga*, *Cyanolanius*, *Schetba* and *Euryceros*; recent cladistic analysis based on morphological characters, however, suggests that it may not belong in the present family, but could be closer to drongos (Dicruridae) and monarch-flycatchers (Monarchidae). Monotypic.
Distribution. Toliara region, in SW Madagascar.
Descriptive notes. 14–15 cm; 15–17·4 g. A small vanga reminiscent of a tit (Paridae). Male has black lores and thin black line from upper eye to above bill, bordered above by narrow white line; pale grey crown, nape and mantle; flight-feathers and tertials brown, upperwing-coverts brick-red, greater and primary coverts oftenbrownish-grey distally; tail pale brick-red with central pair of feathers brownish; cheek and ear-coverts white, contrasting black chin, throat and lower side of neck; underparts whitish, breast and flanks with pale pink suffusion; iris pale lemon-yellow; bill black; legs pinkish-grey. Differs from *C. madagascariensis* in larger size, pale iris, longer bill, tail



and legs and shorter wing (giving rather elongated appearance), also in having red upperwing-coverts, different head pattern, black bib sometimes more extensive, pinkish wash below. Female is olive-tinged grey-brown above, with pale reddish rump and tail (reddish colour restricted to outer webs) and brick-red lesser and median wing-coverts, throat whitish, underparts washed buff, blending to whitish on belly, bare parts as for male; differs from very similar female *C. madagascariensis* mainly in larger size, reddish (not brown) shoulder, and pale (not dark) eye. Juvenile undescribed. Voice. Alarm or contact call a peevish "karr-trkkk", first note like that of a sunbird (Nectariniidae); also gives loud, rolling, descending rapid "ksisisisisususu" cadence with slight whistling quality, possibly as contact. Male song a loud "tyuh-tee" or "pu-teer", second note louder and more whistled; female often gives contact call immediately after male song, in duet-like fashion.
Habitat. Little known. Sub-arid thorn-scrub at c. 100 m.
Food and Feeding. Small invertebrates. Forages usually in dense low bushes 2–3 m tall. Principal techniques are gleaning and sally-gleaning. Often in small family parties.
Breeding. No information.
Movements. Probably sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in South Malagasy Spiny Forests EBA. Has tiny global range and appears to have a very small population. Known only from a small area of unprotected forest in Toliara region, in SW Madagascar. Described as a new species in 1997, on basis of two specimens collected 50 years earlier; photographed in the wild in 1992, and in July 1997 about nine males observed in same area (on road between La Table and St Augustin), where suitable habitat of c. 30 km², suggesting possible population of 30–100 pairs. Subsequently found farther S at several sites on Mahafaly Plateau, including Hatokaliotsy and Tsimanampetsotsa, but at apparently low density; at start of 21st century was located at Linta, c. 50 km S of previous known S limit, and suitable habitat exists farther S of this site. Threatened by degradation and loss of specialized habitat, which currently subject to shrub clearance for charcoal and grazing by goats; timber extraction a further problem at some sites. Much suitable habitat still remains intact, as soil unsuitable for agriculture human inhabitants are predominantly fishermen and goat-herders. If loss of suitable habitat increases, species may become Endangered.
Bibliography. Anon. (1999, 2008m), Appert (1970), Butchart & Stattersfield (2004), Goodman, Hawkins & Domergue (1997), Hawkins, Rabenandrasana *et al.* (1998), Langrand (1990), Milon *et al.* (1973), Morris & Hawkins (1998), Nicoll & Langrand (1989), Schulenberg (2003), Sim & Zefania (2002), Sinclair & Langrand (1998), Stattersfield & Capper (2000).

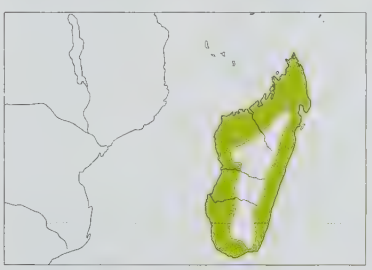
Genus *VANGA* Vieillot, 1816

3. Hook-billed Vanga

Vanga curvirostris

French: Vanga écorcheur **German**: Hakenschnabelvanga **Spanish**: Vanga Picudo

Taxonomy. *Lanius curvirostris* Linnaeus, 1766, Fort Dauphin (Tôlanaro), south-east Madagascar.
Recent molecular-genetic analysis indicates that genus may be closest to *Calicalicus*, *Cyanolanius*, *Schetba* and *Euryceros*. Two subspecies recognized.
Subspecies and Distribution.
V. c. curvirostris (Linnaeus, 1766) – N, W & E Madagascar.
V. c. cetera Bangs, 1928 – S Madagascar.



Descriptive notes. 25–29 cm; 53·5–80·5 g. A medium-sized vanga with long hook-tipped bill, legs long and sturdy. Nominate race has area from eye and central crown back to upper nape glossy black, rest of head and neck, including nuchal collar, white; upperparts black, median and greater upperwing-coverts with wide white outer fringes and tips (forming white panel on closed wing), primaries and secondaries with narrower white fringes; basal two-thirds of tail mid-grey, subterminal band black, tip white; underparts white; iris very dark brown; bill black, small silvery spot near tip, length 25–30 mm; legs dark blue-grey. Sexes similar. Juvenile is similar to adult, but black of upperparts variably marked with brown, base of bill initially grey. Race *cetera* differs from nominate in tending to have bill longer (27–30 mm) and thinner, black on head reaches to mid-crown but does not extend to lower nape, making white nape-collar broader, abdomen greyish-white. Voice. Song a very penetrating, high-pitched whistle, "te-ew", c. 2 seconds in duration, repeated monotonously at regular short intervals in early morning; somewhat ventriloquial. Often, two individuals counter-sing. Call in W of range usually "karr-karr-karr" (accompanied by two or three loud bill-claps) followed by angry "tew-tew-tew-tew"; in E & S often just the last part ("tew" notes). Contact call a quiet "pew".
Habitat. Various original forest types, dense scrub, degraded and primary forests, areas around villages, also plantations far from forest. Nominate race occurs in evergreen humid forest and degraded areas and plantations in lowlands; *cetera* in spiny forest. Sea-level to 1500 m, although scarce above c. 1000 m.
Food and Feeding. Large insects; also small vertebrates, including medium-sized chameleons (Chamaeleonidae), frogs, small birds, bird eggs, and even young *Microcebus* lemurs. Spends long

On following pages: 4. Bernier's Vanga (*Oriolia bernieri*); 5. Lafresnaye's Vanga (*Xenopirostris xenopirostris*); 6. Van Dam's Vanga (*Xenopirostris damii*); 7. Pollen's Vanga (*Xenopirostris polleni*); 8. Sickle-billed Vanga (*Falculea palliata*); 9. White-headed Vanga (*Artamella viridis*); 10. Chabert Vanga (*Leptopterus chabert*); 11. Blue Vanga (*Cyanolanius madagascarinus*); 12. Rufous Vanga (*Schetba rufa*); 13. Helmet Vanga (*Euryceros prevostii*); 14. Tylas Vanga (*Tylas eduardi*); 15. Nuthatch Vanga (*Hypositta corallirostris*).

intervals motionless, watching for prey; also searches for food by slowly inspecting branches and snatching items. Wedges chameleons into horizontal forks and pulls off limbs, before consuming them. Usually solitary, sometimes in pairs; also in mixed-species flocks of vangas or other forest species.
Breeding. Season Oct–Jan in NW (Ampijoroa). Monogamous. Nest built by two individuals (presumed male and female), a bulky cup-shaped structure consisting of dead leaves, covered with spider webs and mosses, usually 3–10 m above ground in fork of tree. Clutch 3 eggs, white and densely covered with small wine-red spots; incubation by both sexes, period c. 22–24 days; chicks brooded and fed by both sexes, nestling period c. 20–22 days.
Movements. Probably sedentary.
Status and Conservation. Not globally threatened. Nominate race rather thinly scattered in evergreen humid forest and degraded areas and plantations in lowlands and is more common in W. S race *cetera* is common from R Mangoky S & E to near Tôlanaro. As this species is not strictly bound to undisturbed forest, its survival is considered not at any immediate risk.
Bibliography. Appert (1968a, 1970), Dee (1986), Hartlaub (1861, 1877), Langrand (1990), Milon *et al.* (1973), Morris & Hawkins (1998), Oberholser (1900), Rakotomanana *et al.* (2001), Schulenberg (2003), Sharpe (1871), Yamagishi & Eguchi (1996).

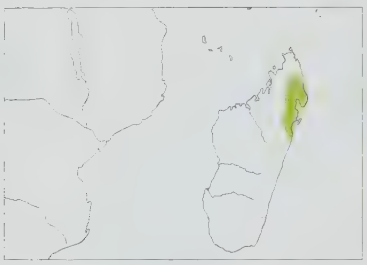
Genus *ORIOLIA* I. Geoffroy Saint-Hilaire, 1838

4. Bernier's Vanga

Oriolia bernieri

French: Oriolie de Bernier **German**: Schwarzvanga **Spanish**: Vanga de Bernier

Taxonomy. *Oriolia bernieri* I. Geoffroy Saint-Hilaire, 1838, Madagascar.
Recent molecular-genetic analysis indicates that genus may be closest to *Xenopirostris*, *Falculea* and *Artamella*. Monotypic.
Distribution. NE Madagascar.



Descriptive notes. 23 cm; 52–59 g. A medium-sized, dark-plumaged vanga with stout conical bill. Male has entire plumage black with blue sheen; iris greyish-white; bill and legs light grey. Female is dark tan-rufous, brighter on wing, almost all feathers with fine black bars (most conspicuous on upperparts and breast); upperwing with uniformly rufous primaries, basal part of primaries often brighter rufous; underwing rufous, underwing-coverts finely black-barred; bare parts as for male. Juvenile is similar to female. Voice. Poorly known. Loud "chew", like that of Common Greenshank (*Tringa nebularia*), and harsh chattering series; in flight, wingbeats produce loud whirring sound.
Habitat. Lowland evergreen humid forest, to c. 1000 m.
Food and Feeding. Invertebrates, including spiders (Araneae), crickets (Orthoptera), cockroaches (Blattodea); also small vertebrates, e.g. geckos (of genus *Phelsuma*). Forages at all levels of vegetation, mainly high in trees. Feeding techniques include gleaning and probing; probing involve poking and winkling, as practised by woodpeckers (Picidae). Regularly strips moss and bark from trees, and able to cling to almost vertical trunks in woodpecker fashion. Closely investigates leaves of pandanus (*Pandanus*), traveller's tree (*Ravenala madagascariensis*) and palms; tosses clumps of debris from bases of leaves. Found in isolated pairs, also in mixed-species flocks made up principally of vangas.
Breeding. Season Sept–Dec (Masoala Peninsula). Breeding system uncertain; sometimes in groups consisting of one female and several males, all of which copulate with female; at one of four nests studied, an immature male copulated with female and also assisted with nest-building and, to minor extent, with incubation of eggs. Nest built by both sexes, mostly by female, cup-shaped, consisting of root material, palm fibres, dry leaves and moss, placed usually 10·8–14·4 m above ground inside palm-leaf whorl. Clutch 3 eggs, pinkish-white and mottled with carmine-red, especially at larger end; incubation by both sexes, period c. 17 days; both brood and feed chicks, nestling period c. 17 days.
Movements. Probably sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in East Malagasy Wet Forests EBA. Confined to N half of E rainforest, where rather scarce and patchily distributed. Recorded at many sites from Marojejy S to Zahamena; an unconfirmed report from much farther S, in Vondrozo (in S Fianarantsoa). Considered at risk because of continuing rapid loss and degradation of already severely fragmented forest habitat, leading to population decrease. Primary lowland rainforest threatened mainly by slash-and-burn cultivation; much of E coastal plain already cleared, and many of remaining tracts of forest highly degraded. Surviving areas of forest under pressure from increasing human population, and in some areas commercial logging. If current trends continue, virtually all remaining forest, especially that at lower elevations, will very likely have disappeared within a few decades. Occurs in several protected areas, i.e. in Marojejy, Masoala and Zahamena National Parks, in Ambatovaky, Anjanaharibe-South and Mangerivola Special Reserves, in Betampona Strict Reserve, and in Anjanaharibe, Bezavona and Haute Rantabe Classified Forests. Effective protection of national parks of particular importance, as these still contain significant areas of good-quality habitat.
Bibliography. Anon. (1999, 2008m), Butchart & Stattersfield (2004), Collar & Stuart (1985), Collar *et al.* (1994), Dee (1986), Delacour (1932), Du Puy & Moat (1996), Evans, M.I. *et al.* (1992), Hartlaub (1877), Langrand (1990), Milon *et al.* (1973), Morris & Hawkins (1998), Schulenberg (2003), Sharpe (1871), Stattersfield & Capper (2000), Thorstrom & René de Roland (1999, 2001), Thorstrom & Watson (1997), Yamagishi & Eguchi (1996).

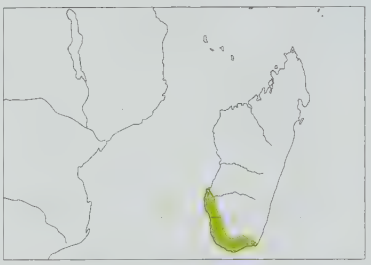
Genus *XENOPIROSTRIS* Bonaparte, 1850

5. Lafresnaye's Vanga

Xenopirostris xenopirostris

French: Vanga de Lafresnaye **German**: Schmalschnabelvanga **Spanish**: Vanga de Lafresnaye

Taxonomy. *Vanga xenopirostris* Lafresnaye, 1850, Madagascar.
Recent molecular-genetic analysis indicates that genus may be closest to *Oriolia*, *Falculea* and *Artamella*. Monotypic.
Distribution. SW & S Madagascar from just N of R Mangoky S in subdesert biome to just E of Tôlanaro.



Descriptive notes. 24 cm; 52–63 g. A medium-sized vanga with plumage mostly black and white; bill stout and laterally compressed, with intermandibular gap. Male has black head, contrasting white throat and broad white collar, which is broken at rear; upperparts, including upperwing-coverts and tail, medium grey, tinged brown (can look darker), primaries, primary coverts and alula sooty grey; white below; iris dark brown; bill grey to bluish-grey, upper mandible with dusky tip variably extending along culmen, pale tip of lower mandible; legs grey-blue. Female differs from male in having black mostly restricted to top of head. Juvenile is similar to female, but has brown markings on scapulars and upperparts. Voice. Most frequent vocalizations a highly characteristic loud, whistled "tseeang" or "tseeeo", and loud "whip", usually given from easily viewed songpost, more rarely in flight; also a slow "chuck chuck chuck", not unlike a call of *Leptopterus chabert*. Also various descending whistles.
Habitat. Sub-arid thorn-scrub, with strong preference for areas with plentiful dead wood. Sea-level to 100 m.
Food and Feeding. Invertebrates, including beetles (Coleoptera), cockroaches (Blattodea), other insects, worms (Oligochaeta); also small vertebrates, e.g. chameleons (Chamaeleonidae). Forages at middle and lower levels, often close to forest floor. Searches methodically in crevices and in nooks and crannies in dead and broken wood, especially beneath dead bark and in twigs. Main techniques gleaning and probing. Usually alone or in pairs, occasionally in small groups of up to eight individuals; often joins other large vangas in mixed-species groups.
Breeding. Few data. Breeding observed in Nov–Dec. Cup-shaped nest of plant matter, reinforced on outside with spider webs, lined with leaf stalks and long rootlets, usually built 5 m above ground in fork of tree. Clutch 2 eggs, reddish-white, sprinkled with reddish-grey spots; incubation by both sexes. No other information.
Movements. Probably sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in South Malagasy Spiny Forests EBA. Not common within its relatively small range.
Bibliography. Appert (1968a, 1968b, 1970), Dee (1986), Delacour (1932), Hartlaub (1861), Langrand (1990), Milon *et al.* (1973), Morris & Hawkins (1998), Schulenberg (2003), Yamagishi & Eguchi (1996).

6. Van Dam's Vanga

Xenopirostris damii

French: Vanga de Van Dam **German**: Van-Dam-Vanga **Spanish**: Vanga de Van Dam

Taxonomy. *Xenopirostris damii* Schlegel, 1865, Ambassuan (Ambasohana), near Ambaro Bay, north-west coast of Madagascar.
Recent molecular-genetic analysis indicates that genus may be closest to *Oriolia*, *Falculea* and *Artamella*. Monotypic.
Distribution. N & NW Madagascar.



Descriptive notes. 23 cm. A medium-sized vanga with stout, laterally compressed bill. Male has black head, contrasting white throat and broad white collar, broken at rear; upperparts dark grey, somewhat darker on mantle; upperwing and tail dark grey, blackish or sooty-grey primaries, primary coverts and alula; chin, throat and underparts white; iris blackish; bill and legs dark grey. Female has forehead and lores whitish to pale buff, cheek, chin and throat whitish, front and top of head, nape and back of neck black with blue sheen, upperparts brown-tinged, breast and belly sometimes tinged buff; rest of plumage and bare parts similar to those of male. Juvenile is like female, but generally somewhat paler, with brown markings on scapulars and upperparts, breast and belly pale brown. Voice. Calls include "tseeang" or "tseeeo" whistle on falling scale, also a loud "whip", and quieter whistling or clucking notes as alarm or contact. Two individuals sometimes produce antiphonal duet.
Habitat. Primary dry deciduous forest and immediately adjacent vegetation.
Food and Feeding. Invertebrates, including beetles (Coleoptera), cockroaches (Blattodea), other insects, worms (Oligochaeta); also small vertebrates, e.g. chameleons (Chamaeleonidae). Strips loose bark from tree trunks and branches, investigates clumps of dead leaves, removes epiphytes; sound made by falling debris often gives away the species' presence. Gleans items, and extracts prey from dead trunks and branches by probing. Usually alone or in pairs, and sometimes in family parties of 4–8 individuals; often joins other vangas, e.g. *Schetba rufa*, and occurs in mixed-species feeding flocks.
Breeding. Season Oct to at least Jan. Monogamous. Territorial. Nest built by both sexes, cup-shaped, consists of dead leaves and covered with spider webs, usually 6·5–14·5 m above ground in fork of tree. Clutch 3–4 eggs, white with reddish-brown spots; incubation by both sexes, from first egg; chicks brooded and fed by both sexes. No other information.
Movements. Sedentary.
Status and Conservation. ENDANGERED. Restricted-range species: present in West Malagasy Dry Forests EBA. Locally fairly common. Has tiny global range, and in recent decades recorded at only two widely separated localities, Ankarafantsika National Park (in NW) and Analamerana Special Reserve (in N). Population thought to be relatively small; pairs occupy widely separated, non-contiguous home ranges of 5–8 ha, suggesting density of c. 4 pairs/km². Confined to undisturbed dry deciduous forest, a habitat which, at both sites, is under great pressure, especially from fire. Originally described from an area between its two current sites, but no further records from there; much apparently suitable habitat remains in this intervening area, but this has not been thoroughly surveyed. Nevertheless, this species' habitat is becoming reduced in extent and diminishing in quality; main causes are the clearing and burning of forest for subsist-

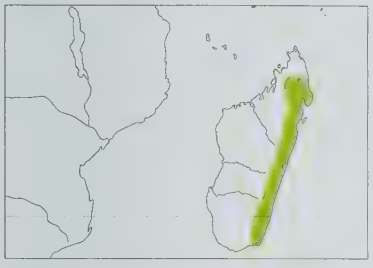
ence cultivation, uncontrolled bushfires, commercial logging, and exploitation for charcoal and firewood. Although both of its known localities are officially protected areas, their long-term future is not secure.
Bibliography. Anon. (1999, 2008m), Butchart & Stattersfield (2004), Collar & Stuart (1985), Collar *et al.* (1994), Dee (1986), Hartlaub (1877), Hino (2002), Langrand (1990), Lavauden (1932), Milon *et al.* (1973), Mizuta (2005), Mizuta *et al.* (2001), Morris & Hawkins (1998), Schulenberg (2003), Stattersfield & Capper (2000), Woolaver *et al.* (2004), Yamagishi & Eguchi (1996).

7. Pollen's Vanga

Xenopirostris polleni

French: Vanga de Pollen **German**: Pollenvanga **Spanish**: Vanga de Pollen

Taxonomy. *Vanga polleni* Schlegel, 1868, north-west coast of Madagascar.
Recent molecular-genetic analysis indicates that genus may be closest to *Oriolia*, *Falculea* and *Artamella*. Monotypic.
Distribution. E Madagascar.



Descriptive notes. 24 cm; 61·5–65 g. A medium-sized vanga with stout, laterally compressed bill. Male has black head and throat, white side of neck; upperparts, including upperwing and tail slaty grey, primaries, primary coverts and alula blackish; black of throat extends narrowly to upper breast, rest of underparts whitish, occasionally tinged pale orange; iris blackish; bill light bluish-grey; legs dark grey. Female is similar to male, except that blackish hood extends only to chin and throat (not to upper breast), breast variably (sometimes strongly) tinged orange, usually has white band below hood lacking orange coloration, and upperparts have stronger olive tinge. Juvenile is similar to adult, but when very young is pale orange below, like female but and with slightly less extensive hood, has pale pink bill and conspicuous orange gape; possible one-year-old male has breast blotchy orange with some black spots. Voice. Wide variety of calls, including characteristic loud descending "tseeang" or "tseeeo", also "whip". Other calls include quiet "chuck-chuk-chuk" in alarm, and various loud discordant whistles; "whit-whit-whit" contact call, similar to that of *Tylas eduardi*. Two individuals give antiphonal duet.
Habitat. Primary evergreen humid forest; sea-level to c. 2000 m.
Food and Feeding. Invertebrates, including beetles (Coleoptera), cockroaches (Blattodea), other insects and larvae, worms (Oligochaeta); also small vertebrates, e.g. chameleons (Chamaeleonidae). Forages mostly in middle and upper levels of forest. Investigates dead wood, seeks food under dead bark, examines twigs; main techniques are probing and gleaning. Singly, in pairs, and in family groups of 3–4 individuals, but most often within multi-species flocks with other vangas, including *Tylas eduardi*.
Breeding. Few data. Breeding observed in Sept–Dec; nestlings in Sept at Ranomafana. Cup-shaped nest made from leaves and grass blades, usually 5 m above ground in fork of tree. Clutch 2 eggs; male and female participate equally in brooding and feeding of young. No other information.
Movements. Probably sedentary.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in East Malagasy Wet Forests EBA. Locally not uncommon to scarce, and rather patchily distributed. Quite common between 400 m and 2000 m in S of evergreen humid forest belt from Ranomafana S to near Andohahela; scarce or apparently absent from many forest blocks farther N, such as Mantadia, Masoala, Perinet-Analamazaotra and Marojejy. Population believed to be rather small, and expected to experience a fairly rapid decline within a decade or two owing to forest clearance and degradation. Forest habitat threatened by slash-and-burn cultivation and commercial logging; if present trends not halted, much of the remaining forest, especially at lower elevations, will have gone within c. 20 years. Status requires monitoring.
Bibliography. Anon. (2008m), Butchart & Stattersfield (2004), Collar & Stuart (1985), Collar *et al.* (1994), Dee (1986), Delacour (1932), Du Puy & Moat (1996), Goodman, Pidgeon *et al.* (1997), Hartlaub (1877), Hawkins & Goodman (1999), Langrand (1990), Milon *et al.* (1973), Morris & Hawkins (1998), Putnam (1996), Schulenberg (2003), Stattersfield & Capper (2000), Yamagishi & Eguchi (1996).

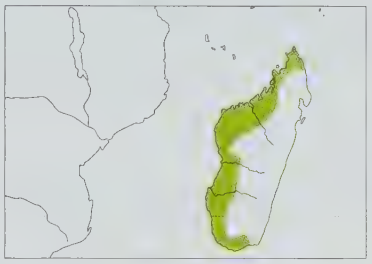
Genus *FALCULEA* I. Geoffroy Saint-Hilaire, 1836

8. Sickle-billed Vanga

Falculea palliata

French: Falculie mantelée **German**: Sichelschnabelvanga **Spanish**: Vanga Piquicurvo
Other common names: Sicklebill, Falcule

Taxonomy. *Falculea palliata* I. Geoffroy Saint-Hilaire, 1836, Madagascar.
Recent molecular-genetic analysis indicates that genus may be closest to *Oriolia*, *Xenopirostris* and *Artamella*. Monotypic.
Distribution. N, W & S Madagascar.
Descriptive notes. 32 cm; 106–119 g. Distinctive; the largest vanga, and with exceptionally long (to 70 mm), strongly decurved bill and sturdy legs. Has white head, neck, chin and throat, and underparts; upperparts black with blue sheen, rump white, upperwing and tail black; white underwing-coverts; iris blackish-brown, orbital ring blackish-slate; bill bluish-grey fading to ivory tip, gape blackish-slate; legs dark grey to pale blue. Sexes alike. Juvenile is similar to adult, but black back and wing feathers tipped with buff. Voice. Various loud screeching, crying and chortling sounds, given by group-members in unison, particularly when going to roost. Most characteristic call a loud "wa-aah", like sound of a crying baby. Contact call a nasal "gaaa gaaa gaaa"; alarm "kekekeke...".
Habitat. Dry deciduous forest and thorn-forest; also savanna, even if sparsely wooded, and wooded areas around villages. Sea-level to 900 m.
Food and Feeding. Invertebrates, including spiders (Araneae), cockroaches (Blattodea), crickets and grasshoppers (Orthoptera), beetles (Coleoptera), other insects, worms (Oligochaeta); also small



vertebrates, e.g. geckos (Gekkonidae). Nestling diet includes similar range of invertebrates, also small vertebrates such as geckos and chameleons (Chamaeleonidae). Favours large branches, living or dead, for foraging. Uses long bill to probe into holes and crevices in trunks of dead and live trees and to lever off bark; gleans insects from surfaces. Holds large prey items with its feet and dismembers them with bill. Gregarious, more so during non-breeding season, when forms flocks of 20–30 or more individuals (and communal roosts numbering in excess of 50); foraging groups often mix with *Artamella viridis*, and often seen with Madagascar Crested Drongos (*Dicrurus forficatus*). When not calling, a feeding group of present species can be remarkably inconspicuous, startling the human observer by flying up from a tree while calling vigorously.
Breeding. Season Oct–Jan in NW (Ampijoroa). Polyandrous: more than two males copulate with one female, and all males (and female) feed young; males participate in territorial defence, in defence against predators and, infrequently, in nest-building, incubation and brooding. Nest cup-shaped, large (diameter 30–40 cm), made from thorny or smooth twigs, interior lined with more delicate material, built 9–16 m above ground and usually in fork of tree. Clutch 3–4 eggs, creamy white and heavily mottled, especially at larger end, with grey to violet-grey or maroon; incubation period 16–18 days; nestling period 19–23 days.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Common to fairly common in most of range, especially in W & S. Occurs in several protected areas, e.g. Ankarafantsika National Park (Ampijoroa), Kirindy and Andohahela National Parks and Berenty Reserve.
Bibliography. Appert (1968a, 1968b, 1970), Dee (1986), Eguchi, Amano & Yamagishi (2001), Langrand (1990), Marcordes & Rinke (2001), Milon *et al.* (1973), Morris & Hawkins (1998), Nakamura, Yamagishi & Okamiya (2001), Oxford & Bish (1999), Schulenberg (2003), Tingay & Gilbert (2000), Yamagishi & Eguchi (1996).

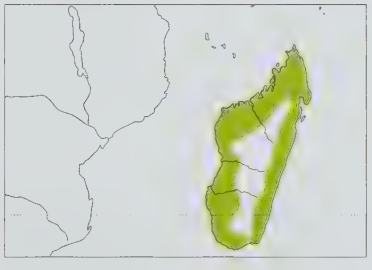
Genus *ARTAMELLA* W. L. Sclater, 1924

9. White-headed Vanga

Artamella viridis

French: Artamie à tête blanche **German**: Weißkopfvanga **Spanish**: Vanga Cabeciblanco

Taxonomy. *Lanius viridis* Statius Müller, 1776, Fort Dauphin (Tôlanaro), south-east Madagascar.
Genus sometimes subsumed in *Leptopterus*. Recent molecular-genetic analysis indicates that genus may be closest to *Oriolia*, *Xenopirostris* and *Falculea*. Races very poorly differentiated; species perhaps better treated as monotypic. Two subspecies tentatively recognized.
Subspecies and Distribution.
A. v. annae (Stejneger, 1879) – W & S Madagascar (S from R Sambirano).
A. v. viridis (Statius Müller, 1776) – N & E Madagascar.



Descriptive notes. 20 cm; 44–57 g. A medium-sized vanga with stout, conical bill. Male has white head and underparts; upperparts black with green sheen, small white area on rump; upperwing and tail black with green sheen, primaries plain black; underside of wing black, except for white underwing-coverts; iris blackish-brown, orbital ring blackish-slate; bill blue-grey, paler tip, gape blackish-slate; legs blue-grey. Female is similar to male, but has head grey, usually lighter on throat, sometimes a dark post-ocular line, small area on rump grey (not white), chest pale grey, belly, flanks and undertail-coverts white with tan tinge. Juvenile is similar to male, but has dark crown and broad brown feather fringes above; immature like female, with grey head and breast, but has upperparts unglossed and much browner. Races differ only in bill size: *annae* has marginally longer bill than nominate. Voice. Male sings from regular songposts a whistling "weety-woo weety-woo weety-woo"; responds to songs of neighbouring males. Various loud chucking and whistling calls, including short "whert".
Habitat. Found in all native forest types, also in second growth, and sometimes in savanna and wooded areas far from native forest; nominate race mostly in evergreen humid forest in E. Sea-level to 1500 m, occasionally higher.
Food and Feeding. Invertebrates, including spiders (Araneae), caterpillars, grasshoppers and crickets (Orthoptera); also small vertebrates, e.g. chameleons (Chamaeleonidae); some fruits and seeds also consumed. Forages mainly in middle and upper levels of vegetation, sometimes lower; rarely observed on ground. Searches for food items on branches of all sizes, even if almost vertical. Probes under peeling bark, occasionally removing fragments; often hangs upside-down. Investigates insect refuges under bark and epiphytes, breaks open dead twigs. Main capture techniques are snatching and gleaning, also sally-gleaning, from leaves and branches. Holds large prey with one foot and uses large bill to dismember them. Sociable; often in mixed-species feeding flocks with other vangas.
Breeding. Recorded in Oct–Jan in NW (Ampijoroa). Sometimes breeds co-operatively; pair occasionally has a helper, apparently a moulting immature male, which participates in territorial defence and mobbing of predators, indulges in allopreening with pair, but does not assist with brood-feeding. Nest built by both pair-members, a cup-shaped structure made from woven plant fibres and twigs, covered with spider webs, usually 6–19 m above ground in fork of tree. Clutch 3 eggs, laid one per day, white, speckled with chestnut, grey and brown; incubation by both partners, period c. 19 days; chicks brooded and fed by both pair-members, nestling period 22–24 days.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Widespread and generally common; possibly less common in S of range. Not reliant on undisturbed forest. Occurs in numerous protected areas throughout range.

Bibliography. Appert (1968a, 1970), Böhning-Gaese *et al.* (1995, 1999), Dee (1986), Hartlaub (1877), Hino (2002), Langrand (1990), Milon *et al.* (1973), Morris & Hawkins (1998), Nakamura, Yamagishi & Nishiumi (2001), Schulenberg (2003), Yamagishi & Eguchi (1996).

Genus *LEPTOPTERUS* Bonaparte, 1854

10. **Chabert Vanga**

Leptopterus chabert

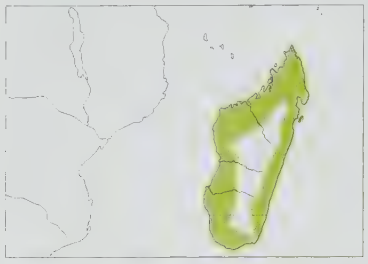
French: Artamie chabert **German**: Elstervanga **Spanish**: Vanga Chabert

Taxonomy. *Lanius cha-bert* Statius Müller, 1776, Fort Dauphin (Tôlanaro), south-east Madagascar. Recent molecular-genetic analysis indicates that genus may be closest to *Newtonia*, which is currently placed in Old World warbler family (Sylviidae). Two subspecies recognized.

Subspecies and Distribution.

L. c. chabert (Statius Müller, 1776) – W, N & E Madagascar.

L. c. schistocercus (Neumann, 1908) – SW Madagascar.



Descriptive notes. 14 cm; 17·6–26·7 g. A small vanga with prominent, broad blue eyering. Nominate race has forehead, crown, lores, ear-coverts, nape and entire upperparts, including upperwing and tail, black with glossy blue sheen; chin, throat, side of neck and underparts white; iris dark red, fleshy eyering sky-blue above and ultramarine below; bill pale blue; legs blackish. Sexes similar. Juvenile is similar to adult, but lacks blue eyering, has white shaft streaks and tips on black head feathers (making head look pale, with just a dark line through eye), and white fringes on back and wing feathers; fringes gradually lost, on older juvenile reduced to white edges on upperwing-coverts. Race *schistocercus* differs from nominate in having outer tail feathers white for two-thirds of length, with tips black. Voice. Call a characteristic mechanical note, rhythmically repeated at 2–3 per second, "tch-tch-tch-tch", often by several individuals together; often the first indication of a group flying overhead. Also series of "teedee" notes. Clacks bill when irritated.

Habitat. All native forest types, also secondary regrowth, scrubby vegetation and plantations, sometimes far from native forest; also wooded outskirts of villages. Sea-level to 1000 m, occasionally at higher levels.

Food and Feeding. Invertebrates, including beetles (Coleoptera), cockroaches (Blattodea), other insects, worms (Oligochaeta); also small vertebrates, e.g. chameleons (Chamaeleonidae); also small berries. Forages mainly in canopy, where hangs upside-down from outer twigs; frequently feeds aerially in or above canopy. Techniques used are gleaning, sally-gleaning, hover-gleaning and aerial hawking. In one study, at least 50% of observed foraging actions were gleans and 20% involved hovering and hawking. Makes long swoops in air in pursuit of flying insects; skilled aerial sally-feeder, rather reminiscent of a woodswallow (Artamidae). Forages in small groups, occasionally in larger parties of up to c. 30 individuals; sometimes in mixed-species flocks, and then usually employs sally-gleaning as main capture technique.

Breeding. Recorded in Aug–Mar; season Sept–Jan in NW (Ampijoroa). Co-operative breeder, with one or more helpers, sex of which unknown. Cup-shaped nest made from plant fibres and twigs, woven into basket shape, bound together with spider webs, usually anchored to horizontal branch 6–19 m above ground in tree. Clutch 3–4 eggs, dull bluish-green with small violet-grey to olive-brown specks; incubation of eggs and brooding and feeding of chicks by both parents, chicks fed also by helpers; no information on duration of incubation and nestling periods.

Movements. Probably sedentary.

Status and Conservation. Not globally threatened. Widespread, and common or fairly common throughout range. Nominate race common in all forest types, somewhat less abundant in evergreen humid forest in E; probably most numerous at edges of primary forest in W of range. Race *schistocercus* restricted to subdesert in SW, where fairly common.

Bibliography. Appert (1968a, 1968b, 1970), Dee (1986), Langrand (1990), Milon *et al.* (1973), Morris & Hawkins (1998), Nakamura, Okamiya, Hasegawa & Hasegawa (2009), Nakamura, Okamiya, Hasegawa, Hasegawa & Yamagishi (2008), Schulenberg (2003), Yamagishi & Eguchi (1996).

Genus *CYANOLANIUS* Bonaparte, 1854

11. **Blue Vanga**

Cyanolanius madagascarinus

French: Artamie azurée **German**: Blauvanga **Spanish**: Vanga Azul
Other common names: Comoro (Blue) Vanga (Comoro races)

Taxonomy. *Loxia madagascarina* Linnaeus, 1766, Fort Dauphin (Tôlanaro), south-east Madagascar. Genus sometimes subsumed in *Leptopterus*. Recent molecular-genetic analysis indicates that genus may be closest to *Calicalicus*, *Vanga*, *Schetba* and *Euryceros*. Comoro races *bensoni* and *comorensis* possibly represent a separate species, differing from nominate in plumage and voice; validity of *bensoni* requires confirmation. Three subspecies currently recognized.

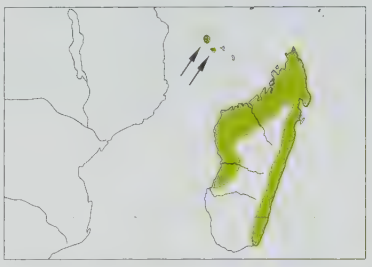
Subspecies and Distribution.

C. m. bensoni Louette & Herremans, 1982 – Grand Comoro (Njazidja), in NW Comoro Is.

C. m. comorensis (Shelley, 1894) – Mohéli (Mwali), in WC Comoro Is.

C. m. madagascarinus (Linnaeus, 1766) – Madagascar (except C & S).

Descriptive notes. 16–19 cm; 19·3–24·5 g. A small, distinctive vanga. Male nominate race has crown, nape, cheek, ear-coverts and upperparts, including upperwing-coverts, blue, crown and nape with slight lilac tinge; black line through eye, extending to base of bill and narrowly above



and below it, including chin; rear ear-coverts edged by narrow, smudged black line; flight-feathers blackish, tail blue with blackish tip; throat and underparts bright white; iris pale sky-blue; bill brilliant pale blue, dark tip and cutting edges; legs blackish. Female is somewhat duller than male; underparts off-white, breast sometimes with light buffy or pale orange wash. Juvenile differs from adult in having grey-blue, less vivid blue, head and upperparts, brown iris and black bill. Race *comorensis* is larger than nominate, has top of head and all upperparts more intense blue, inner webs of inner secondaries and tertials blue (not black), lacks black smudging on rear ear-coverts, narrower black line around eye and bill, tail shorter with broader terminal black band, bill longer and thinner, female more buffish below, juvenile warm buff below; *bensoni* is very like previous, but bill shorter. Voice. Call a very characteristic angry hard rattle, "tccccccch", often repeated several or many times, similar to call of *Leptopterus chabert*; also a harsh "teea teea teea". On Mohéli (race *comorensis*) a softer grating "prrrt" and more protracted "teea".

Habitat. Nominate race inhabits deciduous dry forest in W and evergreen humid forest in E, also adjacent second growth; sea-level to c. 1200 m, rarely (only where there are big trees) to 1600 m. In Comoros found all types of woodland, especially evergreen forest, and coastal scrub, to c. 300 m on Mohéli; on Grand Comoro, confined to forest on slopes of Mt Karthala.

Food and Feeding. Insects, including beetles (Coleoptera) and Orthoptera, also caterpillars; occasionally berries. Stomach contents from Mohéli (race *comorensis*) included also spiders (Araneae). Forages in middle and upper levels of trees. Often feeds while hanging from its feet, upside-down, in leaf clusters near ends of thin branches. Gleans items from substrate; also sally-gleans from branches and leaves. Forages in groups of up to six individuals; commonly in mixed-species flocks with other vangas and with e.g. Common Newtonia (*Newtonia brunneicauda*), Malagasy White-eye (*Zosterops maderaspatanus*), Madagascar Cuckoo-shrike (*Coracina cinerea*), Madagascar Paradise-flycatcher (*Terpsiphone mutata*) and Long-billed Green Sunbird (*Cinnyris notatus*), and other small passerines.

Breeding. Few data. Nesting observed in Dec in Madagascar, where season probably from Sept; males with enlarged testes in Sept in Comoros (Mohéli). Cup-shaped nest placed c. 12 m above ground, often near end of horizontal branch; parents take turns to incubate eggs. No other information.

Movements. Probably mainly sedentary; previously reported as disappearing from broadleaf forest of SW Madagascar during dry season, but this is evidently not the case.

Status and Conservation. Not globally threatened. Fairly widespread; the only member of family found outside Madagascar. Common in most of Madagascar, but appears to be absent from S subdesert; able to live in deciduous dry forest, evergreen humid forest, and second growth. In Comoros, race *comorensis* is reasonably common and widespread on Mohéli. On Grand Comoro, *bensoni* is extremely rare and almost unknown; first definite sighting in Jun–Jul 1974, since when only two further observations, both in August 1981 and at an altitude of c. 900 m; believed possibly extinct by some authors.

Bibliography. Appert (1968a, 1970), Benson (1960), Dee (1986), Hartlaub (1861), Hino (1997, 2002), Langrand (1990), Louette (1988, 2004), Louette & Herremans (1982), Louette & Stevens (1992), Milon *et al.* (1973), Morris & Hawkins (1998), Safford & Evans (1992), Schulenberg (2003), Sinclair & Langrand (1998), Yamagishi & Eguchi (1996).

Genus *SCHETBA* Lesson, 1831

12. **Rufous Vanga**

Schetba rufa

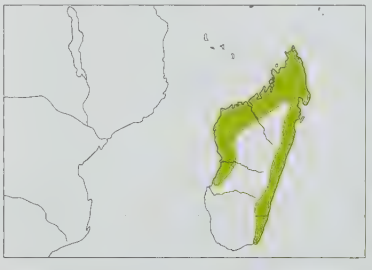
French: Schetbé roux **German**: Rotvanga **Spanish**: Vanga Rufo
Other common names: Red Vanga

Taxonomy. *Lanius rufus* Linnaeus, 1766, Fort Dauphin (Tôlanaro), south-east Madagascar. Recent molecular-genetic analysis indicates that genus may be closest to *Calicalicus*, *Vanga*, *Cyanolanius* and *Euryceros*. Two subspecies recognized.

Subspecies and Distribution.

S. r. occidentalis Delacour, 1931 – W Madagascar.

S. r. rufa (Linnaeus, 1766) – N & E Madagascar.



Descriptive notes. 20 cm; 30·5–44 g. A medium-sized vanga with strong, broad bill. Male has head down to chest, nape and neck black with blue sheen; upperparts, including upperwing-coverts, rufous; primaries dark brown, edged lighter brown on outer side, secondaries and tertials brown-tinged rufous; tail rufous; side of breast, flanks, belly and rest of lower underparts white, white underwing-coverts; iris dark maroon-red; bill blue-tinged grey; legs blue-grey. Female has glossy black front and top of head and nape, rufous upperparts, except for grey nape-collar; rufous upperwing and tail, grey-brown inner half of primaries; whitish cheek, chin and upper throat, fading to light grey chest and flanks, white belly and undertail-coverts, white underwing-coverts; bare parts as for male. Juvenile resembles female, but black of head mixed with dull brown, upperparts and wing dull brown, tail dull rufous, chest tinged brown, iris dark brown, bill black with white tip; one-year-old immature male has black spots extending from neck to throat. Race *occidentalis* differs from nominate only in slightly longer, heavier bill. Voice. Wide variety of beautiful calls. Possible song a smooth, whistled, rippling trill on descending scale; loud and ringing "ti-ti-tong" (the "tong" much lower in pitch) may also be a song, the female responding with "twit-twit-twit". Call a nasal "ees", used as alarm; also as alarm gives a "whip whip whip whip whip" or "kerekerekerekeh", accompanied by bill-snapping. Several calls resemble those of *Euryceros prevostii*, but are finer and more modulated.

Habitat. Lowland evergreen humid forest in E and deciduous forest in W, in areas with open understorey and large trees; requires primary forest. Sea-level to c. 800 m.
Food and Feeding. Invertebrates, including beetles (Coleoptera), cockroaches (Blattodea), other insects, worms (Oligochaeta); also small vertebrates, e.g. lizards, chameleons (Chamaeleonidae) and geckos (Gekkonidae). A sit-and-wait predator, spends long periods perched on low branch, on lookout for potential prey; watches immediate surroundings and seizes prey on branches, trunks, sometimes among dead leaves on forest floor. Feeds on ground more than do other vangas; rarely forages on wing. Flies rarely, and then only for short distances. Main techniques are snatching, gleaning, sally-gleaning, hover-gleaning, less often hawking. Occurs in pairs or, more often, in family groups or in mixed-species flocks with Madagascar Cuckoo-shrike (*Coracina cinerea*), Common Jery (*Neomixis tenella*), Madagascar Paradise-flycatcher (*Terpsiphone mutata*), Common Newtonia (*Newtonia brunneicauda*), Common Tetraka (*Bernieria madagascariensis*), Madagascar Black Bulbul (*Hypsipetes madagascariensis*), and others.
Breeding. Season Oct–Jan in NW (Ampijoroa). Co-operative breeder; pair accompanied by helpers (yearling males and males aged two years and over). Territorial, pair or group maintains territory within which foraging and breeding take place; helpers participate in territorial defence. Nest built by both pair-members, infrequently assisted by helpers, cup-shaped, made from mosses and woven plant fibres and twigs, bound with spider webs, placed 4 m above ground and usually in fork of tree. Clutch 4 eggs, laid one per day, white with small, widely scattered chestnut and reddish spots, increasing in density at larger end; incubation by both pair-members, from first egg, period 14–19 days, generally c. 16 days; chicks brooded and fed by both partners, also by helpers, nestling period 12–17 days, usually c. 15 days.
Movements. Sedentary within territory; location of territories remains the same in successive years.
Status and Conservation. Not globally threatened. Locally common. Often very numerous in primary deciduous forest in W; less common and generally more patchy in distribution in evergreen humid forest in E. Reliant on undisturbed forest.
Bibliography. Appert (1968a, 1968b, 1970), Asai, Mizuta *et al.* (2002), Asai, Shimoda *et al.* (1999), Asai, Yamagishi & Eguchi (2001, 2003), Dee (1986), Eguchi & Yamagishi (2002), Eguchi, Nagata *et al.* (2001), Eguchi, Yamagishi *et al.* (2002), Hartlaub (1877), Hino (1997, 2002), Langrand (1990), Milon *et al.* (1973), Morris & Hawkins (1998), Oxford & Bish (1999), Schulenberg (2003), Yamagishi (2005a, 2005b), Yamagishi & Eguchi (1996), Yamagishi, Asai *et al.* (2002), Yamagishi, Urano & Eguchi (1995).

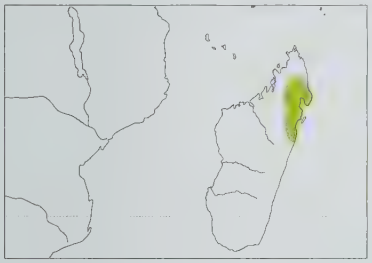
Genus *EURYCEROS* Lesson, 1831

13. **Helmet Vanga**

Euryceros prevostii

French: Eurycère de Prévost **German**: Helmvanga **Spanish**: Vanga de Casco
Other common names: Helmet Bird

Taxonomy. *Euryceros prevostii* Lesson, 1831, "East Indies"; error = Tintingue, east coast of Madagascar. Has in the past sometimes been placed in a separate, monotypic family, Eurycerotidae. Recent molecular-genetic analysis indicates that genus may be closest to *Calicalicus*, *Vanga*, *Cyanolanius* and *Schetba*. Monotypic.
Distribution. NE Madagascar (from Marojejy region S to Tsaratanana and Mantadia).



Descriptive notes. 28–31 cm; 84–114 g. Highly distinctive large vanga with massive hooked bill (51 mm long, 30 mm deep) and rather long, broad tail. Head, alula, primary coverts and remiges, rump and outer tail feathers are solid blue-black, mantle, scapulars, back, secondary coverts and central pair of tail feathers rufous; entire underside black, diffuse delicate light brown stripes on belly, flanks and undertail-coverts; iris pale cream; bill bright blue with black tip; legs black. Sexes similar. Juvenile has black areas of adult pale buff and rufous areas dark brown; bill initially pale horn-coloured. Voice. Song, given early in morning, often before sunrise, a series of c. 8 soft whistled "trec" notes decreasing in volume, often repeated a few times; territorial call described as a pleasant descending ripple, "pipipipewpewpew pew", like that of *Schetba rufa* but not so long or well-phrased, probably the same. Alarm call a harsh "treh treh treh…" or loud nasal "hink hink hink…", like alarm of *Schetba rufa*; contact call a short whistled "phu" and a higher "tseeah", latter like a high-pitched *Vanga curvirostris*.
Habitat. Evergreen humid forest in lowlands and lower middle altitudes; observed at 200–1800 m, but usually between 400 m and 900 m.
Food and Feeding. Insects, including cockroaches (Blattodea), butterflies and moths (Lepidoptera), crickets and katydids (Orthoptera) and beetles (Coleoptera), also other invertebrates; also frogs, geckos (Gekkonidae), chameleons (Chamaeleonidae), and lizards. Forages in middle level of forest; usually perches 3–10 m from ground, often remaining motionless for long periods, and is then difficult to locate. Feeds mostly by sally-gleaning large insects and other invertebrates from leaves and branches, or by seizing prey from ground; c. 80% of observed foraging motions involved snatching and 20% were gleaning. Found singly or in mixed-species flocks with other vangas, Madagascar Cuckoo-shrikes (*Coracina cinerea*) and other forest passerines.
Breeding. Season Oct–Jan in Masoala Peninsula. Monogamous. Cup-shaped nest 15 cm in diameter, made from mosses and woven plant fibres and twigs, placed 2–4 m above ground and usually in fork of tree or inside palm-leaf whorl. Clutch 2–3 eggs, pinkish-white and mottled with carmine-red, especially at larger end; male and female share equally in incubation of eggs and brooding and feeding of chicks; no information on duration of incubation period, nestling period c. 17 days.
Movements. Probably sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in East Malagasy Wet Forests EBA. Uncommon, with patchy distribution; appears to be relatively common in Masoala Peninsula compared with rest of range. Has small global range in NE Madagascar, where confined to primary evergreen humid forest in lowlands. This habitat, on which this species is dependent, is being cleared at rapid rate for subsistence agriculture and timber; species' population is likely therefore to be seriously fragmented and declining. Masoala Peninsula contains Madagascar's largest intact area of low-elevation forest. Recorded in several protected areas, i.e. Mantadia, Marojejy, Masoala and Zahamena National Parks, Ambatovaky and Anjanaharibe-South Special Reserves, Betampona and Tsaratanana Strict Reserves, and Anjanaharibe, Bezavona and Haute Rantabe Classified Forests.
Bibliography. Anon. (1999, 2008m), Butchart & Stattersfield (2004), Dee (1986), Delacour (1932), Du Puy & Moat (1996), Graetz (1991), Hartlaub (1877), La Marca & Thorstrom (2000), Langrand (1990), Milon *et al.* (1973), Morris & Hawkins (1998), Powzyk (1995), Rakotomanana *et al.* (2000), Schulenberg (2003), Stattersfield & Capper (2000), Yamagishi & Eguchi (1996).

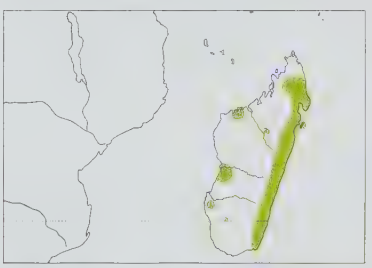
Genus *TYLAS* Hartlaub, 1862

14. **Tylas Vanga**

Tylas eduardi

French: Tylas à tête noire **German**: Bülbülvanga **Spanish**: Vanga Cabecinegro
Other common names: Tylas, Kinkimavo/Kinkimano; Western Tylas Vanga (*albigularis*)

Taxonomy. *Tylas eduardi* Hartlaub, 1862, Alanamasaotra, eastern Madagascar.
In the past, this species has been placed in bulbul family (Pycnonotidae) by some authors and with Old World orioles (Oriolidae), thrushes (Turdidae) or starlings (Sturnidae) by others. Recent molecular-genetic research indicates that it belongs in present family, although this treatment is not supported by cladistic analysis of vanga relationship based on morphological characters. W race *albigularis*, differing from nominate in plumage and voice, sometimes thought to represent a separate species, but a few individuals of each race exhibit characters typical of the other; moreover, in highlands, e.g. at Ambohitantely, both plumage types (white-throated and black-throated) occur. Two subspecies currently recognized.
Subspecies and Distribution.
T. e. albigularis Hartlaub, 1877 – very locally in W Madagascar.
T. e. eduardi Hartlaub, 1862 – E Madagascar (Andapa area S to Tôlanaro).



Descriptive notes. 20–21 cm; 35·5–54 g. A medium-sized vanga with rather slender silhouette. Nominate male has black head to nape and throat (rarely, only a black cap), green-grey upperparts; upperwing green-grey, primaries dark brown; tail green-brown; white band on side of neck and across upper chest, rest of underparts variable but usually notably tinged orangy; lesser underwing-coverts white; rarely has white throat and then usually with deep orange breast; iris typically dark brownish, occasionally pale; bill black; legs lead-grey to black. Sexes similar. Juvenile resembles adult, but has pale buffish fringes on wing feathers, usually slightly paler chin (and sometimes whitish forehead), pale orange base of bill. Race *albigularis* is similar to nominate, but almost always has ear-coverts, cheek, chin and throat whitish, leaving contrasting black cap (rarely, throat black), and breast typically pale or very pale pinkish-orange, variable (sometimes bright orange, sometimes almost white). Voice. Song "weeta weet yew ew". A highly characteristic series of "tu-too whirrit", including at least one whiplash-like note. Contact call a quiet "whit-whit-whit" or "quip-quip". In W range (race *albogularis*) "whitoo-whit, whitoo-whit" song heard, last note strongly upslurred; also a loud fluty whistle.
Habitat. In E range, nominate race frequents primary rainforest, occasionally adjacent second growth, from sea-level to 1800 m. In W, *albigularis* very poorly known and only few data available; recorded in deciduous, almost leafless dry forest, and a few times in mangroves, from sea-level to c. 900 m.
Food and Feeding. Invertebrates, including butterflies and caterpillars (Lepidoptera), dragonflies (Odonata), horseflies and other Diptera, grasshoppers (Acrididae), snails (Gastropoda), spiders (Araneae). Forages mainly in middle and upper levels of forest, in canopy and upper shrub layer. Catches prey by gleaning and hovering; hunts from ambush, often seizes prey on wing. Found in mixed-species flocks with other vangas, and Madagascar Cuckoo-shrike (*Coracina cinerea*), Common Tetraka (*Bernieria madagascariensis*), Madagascar Black Bulbul (*Hypsipetes madagascariensis*), Madagascar Crested Drongo (*Dicrurus forficatus*), Common Newtonia (*Newtonia brunneicauda*), and others.
Breeding. Season Oct–Jan in E of range (Ranomafana); possibly Aug–Sept in W. Monogamous; breeds as simple pair. Male defends territory. Cup-shaped nest 9·5 cm in diameter, built by both sexes, from dead leaves, spider webs and mosses, usually 4–7 m above ground in fork of tree. Clutch 2 eggs, green-blue with small, widely scattered chestnut and reddish-grey spots, increasing in density at larger end; incubation by both parents, mainly by female, period c. 16 days; chicks brooded predominantly by female, less by male, fed by both sexes, nestling period c. 15 days.
Movements. Probably sedentary.
Status and Conservation. Not globally threatened. Nominate race is common to fairly common in most of range. Very poorly known race *albigularis* is rare and very local; recorded at a number of sites from Baty (near Mahajanga) S to R Mangoky region, with isolated record farther S, in forest near Ankazoabo (EC Toliara Province). Species is confined to native forest, where it occurs in a number of protected areas. Study required in order to determine distribution and population size of poorly known W race (*albigularis*).
Bibliography. Appert (1968a, 1970), Dee (1986), Delacour (1932), Dorst (1960c), Hartlaub (1877), Hawkins (1995), Langrand (1990), Milon *et al.* (1973), Morris & Hawkins (1998), Nakamura, Tateno & Rakotomanana (2008, 2009), Oberholser (1900), Schulenberg (2003), Sharpe (1870, 1871), Yamagishi & Eguchi (1996).

Genus *HYPOSITTA* A. Newton, 1881

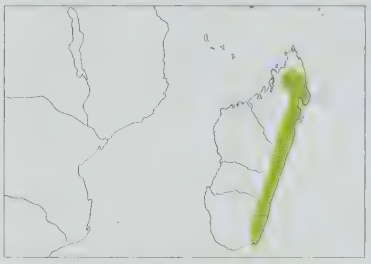
15. **Nuthatch Vanga**

Hypositta corallirostris

French: Hypositte malgache **German**: Korallenschnabelvanga **Spanish**: Vanga Trepador

Other common names: Coralbill, Coral-billed Nuthatch (Vanga), Madagascar Nuthatch; Bluntschli's Vanga (*"perdita"*)

Taxonomy. *Hypherpes corallirostris* A. Newton, 1863, Chasmanna, east Madagascar.
Has in the past sometimes been placed in a separate, monotypic family, Hypositttidae, or in tit family (Paridae), but certain morphological and anatomical features indicate that inclusion in present family more appropriate. Two juvenile specimens found in 1996 in museum drawer in Germany, and originating from primary forest near Eminiminy (N of Tôlanaro), in SE Madagascar, are plain olive-brown with blackish forehead, and similar to present species in size and loose plumage structure, but with much longer tarsus and significantly shorter toes; described as a new species, "*H. perdita*", but could be aberrant examples of present species or some other species, although no further individuals seen and impossible to assess whether they do represent a valid taxon (different species, or race). Monotypic.
Distribution. N & E Madagascar S to Tôlanaro.
Descriptive notes. 13–14 cm; 13·5–15·5 g. A small, highly distinctive vanga; claw of first toe elongated (20 mm). Male has black lower forehead, lores and chin; rest of plumage mid-blue, variably pale buff on vent; iris very dark brown; bill bright orange-red, slightly darker tip of culmen; legs dark grey. Female has brownish-green head lacking clear black eyestripe, buffy forecrown, blue hindcrown, mantle, scapulars, upperwing-coverts and tail, buffish rump, buffish chin, centre of breast and belly; bill duller red than male's. Juvenile is similar to female, but young male acquires increasing amount of blue on head and side of breast with age. Voice. A sequence of quiet hissing or squeaking notes, including "tsee see see", and quiet trill increasing in volume.
Habitat. Undisturbed evergreen humid forest; recorded from sea-level to 1800 m, mainly below 1000 m.
Food and Feeding. Small invertebrates, including beetles (Coleoptera), cockroaches (Blattodea), other insects, worms (Oligochaeta); also small vertebrates. Forages in middle and upper levels of forest. Climbs large and medium-sized tree trunks in manner of a nuthatch (*Sitta*), searching for food on bark; does not work from top downwards. Occasionally forages also on horizontal branches, and sometimes climbs narrow stems and even lianas. Most items captured by gleaning. Most often in groups of two or three individuals, almost always within mixed flocks with other vangas, Madagascar Cuckoo-shrike (*Coracina cinerea*), Madagascar Black Bulbul (*Hypsipetes madagascariensis*), Common Newtonia (*Newtonia brunneicauda*), Madagascar Paradise-flycatcher (*Terpsiphone mutata*), and other passerines.



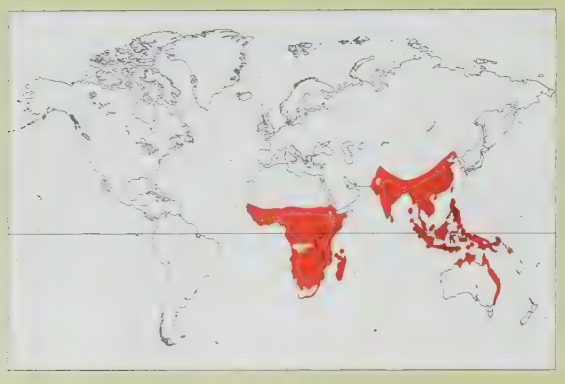
Breeding. Nest found in Oct, and season probably from Aug–Sept. Nest a cup made from live and dead mosses, attached to main trunk of tree. No other information.
Movements. Probably sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in East Malagasy Wet Forests EBA. Fairly common in N part of range; rather rare in S. Locally common in several protected areas, e.g. Marojejy, Mantadia and Masoala National Parks, and Perinet-Analamazaotra Special Reserve, among others. Dependent on rainforest. Mysterious form described as "*perdita*", sometimes treated as a genuine species, is almost unknown; when treated as valid, is considered a Data-deficient taxon. It is possible that since 1931, when the specimens were collected, it has become extinct, despite fact that good-quality forest habitat still exists at locality where originally found; in 1995 survey of fauna of Andohahela, including forest near this site, only present species was found.
Bibliography. Anon. (1999, 2008m), Butchart & Stattersfield (2004), Dee (1986), Delacour (1932), Dorst (1960c), Hawkins & Goodman (1999), Langrand (1990), Milon *et al.* (1973), Morris & Hawkins (1998), Peters (1996), Schulenberg (2003), Sharpe (1871), Stattersfield & Capper (2000), Yamagishi & Eguchi (1996), Yamagishi *et al.* (1997).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family DICRURIDAE (DRONGOS)



- Medium-sized passerines with long tail generally deeply forked, some with terminal tail-racquets; plumage mostly shining or glossy black, sometimes with crest or elongated plumes on head.
- 18–70 cm (including extremely long tail of some species).



- Old World, mostly in tropical and subtropical regions.
- Forest and wooded areas.
- 2 genera, 26 species, 106 taxa.
- 2 species threatened; none extinct since 1600.

Systematics

In 1948, in their attempt to retrace the evolution of the Dicruridae, E. Mayr and C. Vaurie had pointed out the difficulty of determining the closest relatives of this family. Drongos have in the past been considered to be related to the crows (Corvidae), some authors having also suggested a relationship with the shrikes (Laniidae), the Old World flycatchers (Muscicapidae), the cuckoo-shrikes (Campephagidae), the birds-of-paradise (Paradisaeidae), and even the Old World orioles (Oriolidae) or starlings (Sturnidae), on the basis of morphological or behavioural similarities. Modern methods of DNA–DNA hybridization, developed in the 1980s by C. G. Sibley and J. E. Ahlquist, placed the drongos between the fantails (Rhipiduridae) and the monarch-flycatchers (Monarchidae) in the avian classification. More recent molecular-genetic studies have included drongos within the corvoid songbirds that probably radiated from Australasia, and this, together with comparative skeletal evidence, suggests that Australasian monarch-flycatchers are their closest relatives. Like the monarchs, they have a single pneumatized fossa in the head of the humerus and a strongly ossified nasal cavity.

Six decades or more ago, Vaurie undertook a major taxonomic revision of the family and, in 1949, he produced a milestone publication of reference. The drongo family tree which Mayr and he had proposed was based mainly on biogeographical considerations and on morphological characters such as the distribution of gloss and the presence of modified feathers. This classification distinguished between the more primitive forms, with the gloss smooth and uniform, and specialized forms, having an irregular gloss. Primitive forms included the Pygmy Drongo (*Chaetorhynchus papuensis*), differentiated from other dicrurids by its possession of twelve rectrices, instead of ten, the White-bellied Drongo (*Dicrurus caerulescens*) and the Ashy Drongo (*Dicrurus leucophaeus*), along with a group containing all of the African and Indian Ocean drongos and a southern and south-eastern Asian species, the Black Drongo (*Dicrurus macrocercus*), this group being considered to form the "*Dicrurus adsimilis* superspecies". The results of molecular-genetic studies carried out by F. K. Barker and colleagues, published in 2004, indicate that the Pygmy Drongo really belongs with the fantails in the family Rhipiduridae. Specialized forms consisted of all other Asian and Australasian species: the Crow-billed Drongo (*Dicrurus annectans*), the Lesser Racquet-tailed Drongo (*Dicrurus remifer*), the Bronzed Drongo (*Dicrurus aeneus*), the Andaman Drongo (*Dicrurus andamanensis*), the Greater Racquet-tailed Drongo (*Dicrurus paradiseus*), the Balicassiao (*Dicrurus balicassius*), and the forms related to a very large "*Dicrurus hottentottus* superspecies complex" covering 32 taxa. In this family, subspecies are differentiated by body size, the shape and length of the bill and tail, including the depth of the tail fork, and plumage coloration, including the glossiness or velvetiness, and also by the presence and shape of modified feathers on the head, such as crests, hackles and spangles, and on the tail, such as very long outer rectrices that are fully webbed or partly denuded and forming racquets.

More recently, E. Pasquet and co-workers attempted to clarify the relationships within the Dicruridae by using DNA from sequences of two mitochondrial genes in order to reconstruct the phylogenetic tree, and discussed the resulting biogeographical and evolutionary implications. This major study, published in 2007, covered 18 of the 21 species then included in the Dicruridae,



Considered the most primitive drongo, and sole member of the genus Chaetorhynchus, *the* ***Pygmy Drongo*** *differs from all other drongos in having twelve, not ten, rectrices. Its slightly rounded tail recalls that of a fantail. Indeed, genetic studies indicate that* Chaetorhynchus *may actually belong in the fantail family, Rhipiduridae. Similar studies have included drongos within the corvoid songbirds, which probably radiated from Australasia. Comparative skeletal evidence suggests that Australasian monarch-flycatchers (Monarchidae) are their closest relatives.*

[*Chaetorhynchus papuensis*, Heroana, EC New Guinea. Photo: William S. Peckover]



A provisional taxonomic sequence based on DNA studies of 25 out of the 106 taxa currently recognized in the family Dicruridae assigns the ***Wallacean Drongo*** *to the "*hottentottus–balicassius–bracteatus *complex". The main taxonomic problem remaining for this complex is the treatment of the numerous island forms occurring in the Philippines–Wallacea–New Guinea region. Morphological, behavioural and vocal variations suggest that closer studies would probably result in the promotion to full species of several forms currently listed as subspecies.*

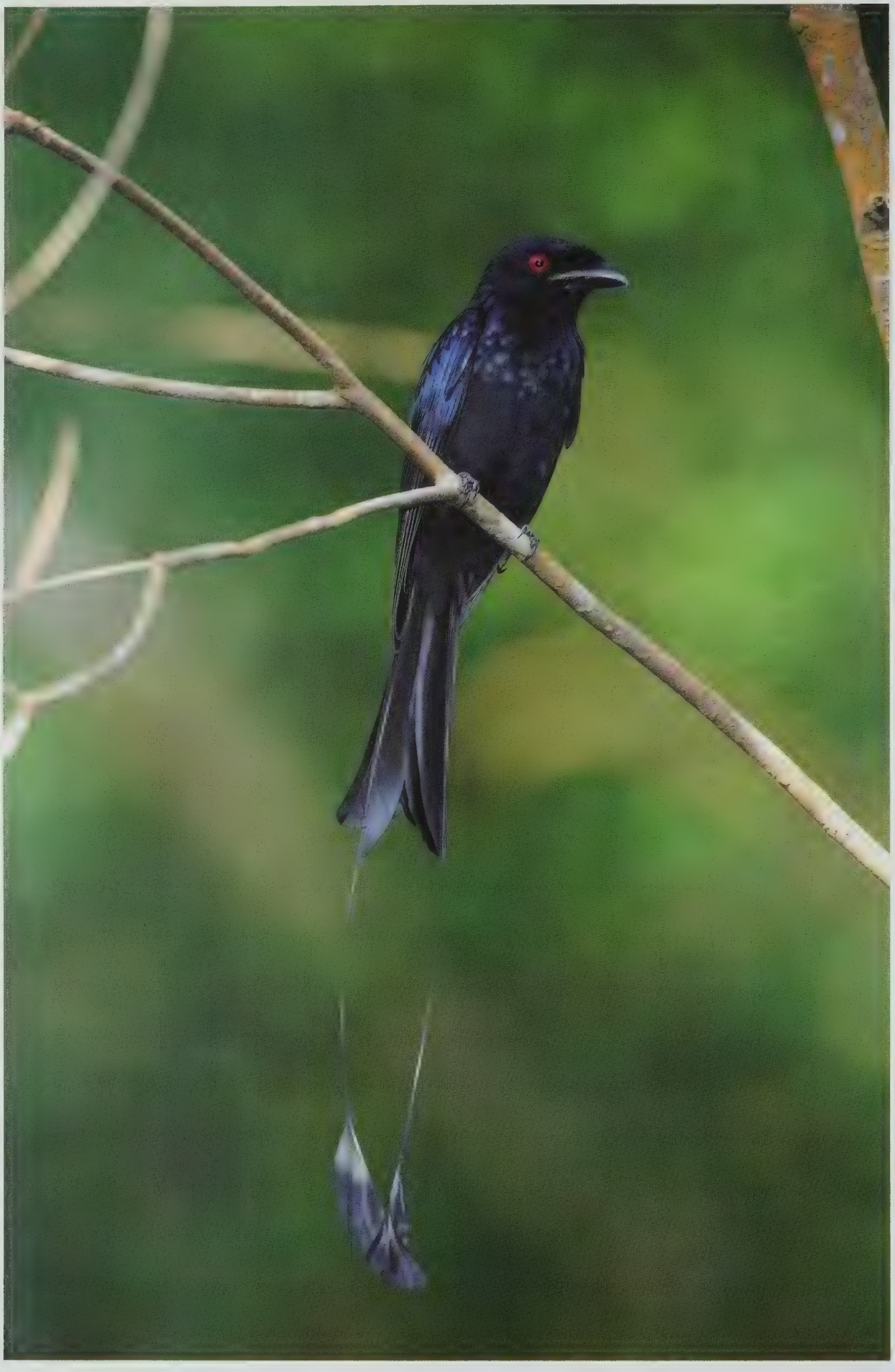
[*Dicrurus densus*, Sumba, Lesser Sundas. Photo: James Eaton]

but it comprised a maximum of only 25 out of the 106 taxa presently recognized in the family. This molecular study is therefore insufficient to answer all the taxonomic questions still pending regarding geographical variation among drongos. While its results confirmed many species arrangements made by Vaurie, it did, however, also reveal unexpected phylogenetic affinities between some species and, as a result, a completely different family tree, as well as the existence of a series of specific radiations and colonization events. On the basis of these results, a new taxonomic sequence is currently proposed, although it must be borne in mind that this is still provisional, as further studies are required on certain species groups.

In this new classification, the most ancient *Dicrurus* species is the Bronzed Drongo, a medium-sized Oriental drongo with a highly metallic gloss, instead of Vaurie's "primitive forms", namely the Square-tailed Drongo (*Dicrurus ludwigii*) and the Shining Drongo (*Dicrurus atripennis*) of the Afrotropics. The Bronzed Drongo seems to have evolved during the Miocene, about 18 million years ago, from a primitive *Dicrurus* ancestor that apparently separated from older avian groups, including the crows, the shrikes, the fantails and the flycatchers, around 35 million years ago, although this cannot be confirmed by the limited fossil record available.

Separation from the Asian drongos by those of Africa and the Indian Ocean islands occurred around 15 million years ago, and was followed by a large diversification in both continents. Within the Asian group, the Lesser Racquet-tailed Drongo is the first species to branch off from all other Australasian and Asian large drongos, of which all except the Balicassiao have an irregular gloss and modified head and/or tail feathers. The Greater Racquet-tailed Drongo and, curiously, the Crow-billed Drongo, which Pasquet and colleagues' molecular study now gives as the former's closest relative, would have diverged into two different species only relatively recently, within the last few million years. Validation of such close relatedness, however, requires sampling from more than one individual of the Crow-billed Drongo, especially as there is a strong suspicion about the species identity of the only specimen used in this study. To this group can be added the Sri Lanka Crested Drongo (*Dicrurus lophorinus*), still considered by some authors to be a subspecies of the Greater Racquet-tailed Drongo, its recent elevation to species rank by P. C. Rasmussen and J. C. Anderton meriting confirmation from DNA and other taxonomic studies. Morphological and possibly vocal distinctness of *lophorinus* from the *ceylonicus* race of the Greater Racquet-tailed Drongo, and the limited number of apparent intergrades, could be seen to favour recognition of *lophorinus* as a full species; indeed, in view of the recent absence of a contact zone, the few putative intergrades could be aberrant individuals, rather than hybrids. These two species, and possibly the Crow-billed Drongo, may have to be treated as a superspecies. The Andaman Drongo, identified by Vaurie as an ancient relative of the Greater Racquet-tailed Drongo, was not included in the recent phylogenetic study. It is provisionally retained in its early position in the classification.

Members of the former "*hottentottus* superspecies" as defined by Vaurie, namely the Hair-crested Drongo (*Dicrurus hottentottus*), the Spangled Drongo (*Dicrurus bracteatus*) and the Ribbon-tailed Drongo (*Dicrurus megarhynchus*), together with the Balicassiao, which Vaurie hesitated to include in the superspecies, form a distinct "*hottentottus–balicassius–bracteatus* complex"; this radiated about 6 million years ago, leading to dispersal across Wallace's Line and the colonization of Australasia by the Spangled and Ribbon-tailed Drongos. Four other forms from Vaurie's "*hottentottus* superspecies", provisionally retained as distinct species although not included in the DNA study, should also be part of this complex. These are the Sulawesi Drongo (*Dicrurus montanus*), already identified as a full species by Vaurie, the Sumatran Drongo (*Dicrurus sumatranus*) and the Wallacean Drongo (*Dicrurus densus*), proposed by C. M. N. White and M. D. Bruce in 1986 as two full species, and the Tablas Drongo (*Dicrurus menagei*), restricted to a very small island in the Philippines and suggested by D. Allen in 2006 as meriting elevation to species rank. Despite the insufficiency of published information for considering the treatment of the Sumatran and Wallacean Drongos as separate species, the fact that both were recognized as such by Sibley and B. L. Monroe in their landmark work *Distribution and Taxonomy of Birds of the World*, and were later integrated in various world bird lists, supports the current treatment. Sibley and Monroe grouped the Sulawesi, Sumatran and Wallacean Drongos within a "*balicassius* superspecies", along with the Balicassiao and the Spangled and the Ribbon-tailed Drongos. The rather large genetic distances between the Hair-crested Drongo, the Spangled Drongo and the Balicassiao found in Pasquet and colleagues' study suggests, however, that a superspecies treatment may not be appropriate. Although no formal proposal has yet been made to elevate the Tablas Drongo to species rank, this taxon's morphological distinctiveness, and its apparent differences in voice, behaviour and habitat preferences from other forms of the Hair-crested Drongo, would appear to justify its current provisional treatment, one that will require further corroboration.



When the racquet feathers are included, the total length of the ***Greater Racquet-tailed Drongo*** *may reach about 70 cm. The greatly elongated sections of the shafts of the outer tail feathers are completely denuded of barbs until, near the tip, the inner web or both webs reappear and form a racquet-like pendant. This may be a relatively unstable character, as specimens with fully webbed outer feathers have been reported for several races of the Greater Racquet-tailed Drongo, including the nominate race,* brachyphorus *and* platurus. *The outermost rectrices of the Sri Lanka Crested Drongo* (Dicrurus lophorinus), *still considered by some authors a race of the Greater Racquet-tailed Drongo, are always fully webbed. Drongos' heads are rather large and sometimes crested, with tufts of frontal feathers starting at the base of the bill and directed forwards and upwards, or sometimes curling backwards to form a large crest from just over the forehead to well beyond the nape. The greatest crest development is reached with the race* grandis *of the Greater Racquet-tailed Drongo, which has fully webbed feathers of up to 66 mm, although some other races of this species completely lack the crest and have only small bristly feathers curling forwards over the culmen. The race* platurus *of southern Peninsula Malaysia, shown here, has elongated frontal feathers mostly directed upwards, forming a bushy tuft, though more rarely this race has a short crest, sometimes curving backwards. Like the race* hypoballus *of northern Peninsular Malaysia,* platurus *has the glossy feathers of the breast arranged into well-defined spangles.*

[*Dicrurus paradiseus platurus*,
Sime Forest, Singapore.
Photo: Teo Nam Siang]



*In flight, the tail feathers of the **Greater Racquet-tailed Drongo** produce a characteristic humming noise, audible from some way off. The wings of drongos are rather long, and either rounded or somewhat pointed. The flight-feathers comprise ten primaries, including a well-developed outermost primary half as long as the next, nine secondaries, and a few tertials. Average wing lengths vary from about 107 mm in the smaller species to 180 mm or more in the largest forms.*

[*Dicrurus paradiseus otiosus*, Andaman Is. Photo: Konrad Wothe]

Information on all the existing types and a preliminary systematic review of the Asian Dicruridae, presently being compiled by E. C. Dickinson and colleagues, indicate, however, the uncertainty remaining in the taxonomy of the large conglomerate of 32 forms initially placed by Vaurie within the "*D. hottentottus* superspecies complex", described as an obvious candidate for subdivision into several species. A first major split was made by White and Bruce in 1986, with the distinction between *D. hottentottus*, renamed as the Hair-crested Drongo, and *D. bracteatus*, which kept the common name of Spangled Drongo; this involved the regrouping of eleven Australasian races of the initial complex. The main taxonomic problem remaining is the separation of the numerous island races described in the Philippines–Wallacea–New Guinea region. While the majority of these allopatric forms have been "lumped" in polytypic species such as the aforementioned Hair-crested and Spangled Drongos, there are important morphological and also behavioural or vocal variations among them, suggesting that closer studies would probably result in the identifying of new species. The separation of the Sumatran Drongo and the Wallacean Drongo, incorporating, respectively, two and six different subspecies, is a first step in that direction, and the Tablas Drongo's status as a species, if confirmed, would be another. Many other races exhibiting significant differentiation could likewise be strong candidates for species rank. This is the case, for instance, with the subspecies *buruensis* and *amboinensis* of the Spangled Drongo, currently containing ten island races, and of subspecies *striatus* and *samarensis* of the Hair-crested Drongo, which has twelve island races. The same could apply also to some insular subspecies of the Greater Racquet-tailed Drongo in the southern Oriental Region.

Following the colonization of Africa by drongos from Asia about 15 million years ago, the Square-tailed Drongo and Shining Drongo appear relatively rapidly and correspond to the most ancient species of the continent, occupying a basal position in the family tree of this group. Curiously, the Ashy Drongo, currently distributed widely over southern and eastern Asia, is the next species to branch off from the African group, providing evidence of a first colonization of Asia by a drongo species having originated in Africa around 10 million years ago. Next in the present classification is the White-bellied Drongo, which was not included in the molecular analysis but is, like the Ashy Drongo, another species from Vaurie's "primitive group". The remaining two African species, the Fork-tailed (*Dicrurus adsimilis*) and Velvet-mantled Drongos (*Dicrurus modestus*), along with the Indian Ocean species and the Black Drongo from Asia, all of which together form what Vaurie identified as the "*D. adsimilis* superspecies complex", correspond to a well-defined monophyletic group. Having originated about 5 million years ago, this group radiated and colonized all of Africa, Príncipe Island and the Indian Ocean islands, as well as, with the Black Drongo, Asia, thereby providing evidence of a second colonization event of Asia by an African species. Although genetic distances among members of this group are too great to support superspecies status, this taxonomic level should still apply to the two vicariant species, the Fork-tailed Drongo and the Black Drongo, present respectively in Africa and Asia. This superspecies may also englobe the continental forms of the Velvet-mantled Drongo, not represented in the molecular study by Pasquet and co-workers, but probably not its Príncipe form, the nominate race, which appears to be genetically well differentiated. The Black Drongo is still very closely related to the Fork-tailed Drongo, from which it probably became differentiated over the last million or so years; until the 1980s, it was systematically referred to by the name *D. adsimilis*, instead of *D. macrocercus*, in many Asian publications. The main morphological difference between the Black Drongo and the Fork-tailed and Velvet-mantled Drongos is that the tail length of the latter two is on average 86% of the wing length, whereas the Black Drongo's tail is longer than the wing, the average being 109%.

The phylogenetic DNA study undertaken by Pasquet and colleagues also revealed an early separation, about 4 million years ago, of the nominate form of the Velvet-mantled Drongo, confined to Príncipe, and the Fork-tailed Drongo. This supports the recognition of the Velvet-mantled Drongo as a distinct species, as proposed by Sibley and Monroe in 1990 and D. J. Pearson in *The Birds of Africa* in 2000, while other authors, including BirdLife International, still treat *modestus* as a subspecies of the Fork-tailed Drongo. Also, such a high level of differentiation does not support Pearson's hypothesis of a *D. adsimilis* superspecies encompassing both species. The validity of the Velvet-mantled Drongo species as currently constituted will not, however, be fully assessed until both continental forms from which the nominate race is likely to have originated, namely the central African subspecies *coracinus* and the West African *atactus*, can be included



It is calculated that around 15 million years ago the drongos of Africa and the Indian Ocean islands separated from the Asian forms. This was followed by a major diversification in both continents. Within the Asian group, the ***Lesser Racquet-tailed Drongo*** *was apparently the first species to branch off. Its outermost rectrices are greatly elongated, bare and wire-like, ending in the racquets, which differ in size and shape among the four subspecies. The female is similar to the male but smaller, with a shorter tail ending in similar racquets. Malformed or broken outer tail feathers can be used by ornithologists for individual recognition.*

[*Dicrurus remifer peracensis*, Fraser's Hill, Malaysia. Photo: Morten Strange]

in a full molecular-genetic analysis. It is possible that one or both of these races may actually prove to be closer to the Fork-tailed Drongo than to the Príncipe form of the Velvet-mantled Drongo, which would then require a redefinition of the subspecific composition of the *D. modestus* species, and possibly also of its English name.

Another important result from the 2007 molecular study is the fact that drongos from Indian Ocean islands do not form a monophyletic assemblage. The colonization of these islands by an ancestor of the "*D. adsimilis* group" seems to have occurred very early, shortly after its arrival in Africa, and to have followed a complex pattern. The most ancient species is the Comoro Drongo (*Dicrurus fuscipennis*), which originated about 5 million years ago and appears to be the closest relative of the Fork-tailed and Velvet-mantled Drongos. As the estimated age of Grand Comoro island, to which it is restricted, is only 0·5 million years, this species must have originated from another, older island in this volcanic archipelago, such as neighbouring Mohéli. Furthermore, it does not appear to be closely related to other drongo species from the Indian Ocean. The Mayotte Drongo (*Dicrurus waldenii*) appears at around the same time and is as old as Mayotte itself, branching off from the ancestor of the Madagascar Crested Drongo (*Dicrurus forficatus*) that colonized Madagascar. The recent colonizations by the latter of Aldabra and then the Comoro island of Anjouan, estimated to have occurred within the last 100,000 to 150,000 years, have led to the differentiation of a new species, the Aldabra Drongo (*Dicrurus aldabranus*), which lost the tufted crest, and, on Anjouan, of a new subspecies, named *potior*, of the Madagascar Crested Drongo. This confirms the little phylogenetic value of the crest, which can appear and disappear easily in the various lineages, in both ancient and recent forms of both Asian and African groups.

Further systematic studies based on molecular DNA analysis, but also on other parameters, including voice and ecology, should be conducted on all known drongo forms, in particular within the Philippines–Wallacea–New Guinea region and within the "*D. adsimilis–D. modestus* group", in order to clarify the taxonomic and geographical limits of neighbouring related species and to resolve taxonomic uncertainties. In the general context of a decline of tropical forests, it is essential to confirm or identify rapidly all species and subspecies. Only with this information will it be possible to provide effective protection of their habitats and to devise appropriate conservation programmes (see Status and Conservation).

Morphological Aspects

In the field, drongos appear generally as medium-sized glossy black woodland birds with a robust, slightly hooked bill, and a relatively long tail, which may be forked and have elongated decorative rectrices. Despite the high morphological homogeneity of this group, significant variations exist among species in terms of general size and wing length, details of plumage coloration, the intensity of gloss and velvetiness, the shape and length of the tail and bill, the modification of the outermost tail feathers, the presence or absence of a crest, the development of spangles and hackles, and the colour of the iris. Further, these characters may vary geographically within a single species and justify the naming of different races. The frontal feathers and the rectrices exhibit the greatest tendency for specific development or variation in the evolution of drongos, particularly in Asia, where it is most spectacular. Differentiation of such visual characters facilitating intraspecific recognition may be linked to the presence of many sympatric drongo species, especially since drongos are very similar in plumage coloration and their vocalizations are not always specifically distinctive. There are, for example, up to seven sympatric species in the region from peninsular India east to south-east China.

Body length varies from that of the Square-tailed Drongo, 18–19 cm, to that of the much larger Ribbon-tailed Drongo, which is 51–56 cm and sometimes up to 63 cm. These figures include the tail of all except the two racquet-tailed drongos, which have extremely long outer rectrices. Particularly small species include the Pygmy Drongo, at 20–22 cm, the Bronzed and White-bellied Drongos, 23–24 cm, and the Shining Drongo, which measures 21–24 cm. At the other extreme, the Wallacean Drongo subspecies *megalornis* and the Mayotte Drongo are among the longest dicrurids, both sometimes reaching as much as 38 cm. When racquet feathers are included, the total length may reach 70 cm



All drongos have black bills. These are almost always strong, and particularly broad and deep at the base, this being especially evident in the ***Crow-billed Drongo****. The base of the bill is covered by dense short feathers, with well-developed rictal bristles, possibly to protect the face and eyes during struggles with prey. The bill is hooked at the tip, compressed and well notched for seizing and holding prey. The nasal cavity is heavily ossified, and the palate reinforced by an extended bony plate to allow mastication of large insects with hard carapaces. Powerful jaw muscles are attached to a large depression in each temple. Bill length in the family ranges from about 20 mm to 35 mm.*

[*Dicrurus annectans*, S Peninsular Malaysia. Photo: Tony Tilford]

or more for the race *grandis* of the Greater Racquet-tailed Drongo, with outer rectrices of up to 50 cm. Data on weights are lacking for several species, but the Bronzed and Square-tailed Drongos, weighing 22–30 g and 25–35 g, respectively, appear significantly lighter than the other small, dumpier species. Heavier forms include the race *grandis* of the Greater Racquet-tailed Drongo, which weighs 100–124 g, and the Hair-crested Drongo, weighing 86–102 g.

Few significant morphological differences between the sexes are evident, except, perhaps, for size and weight. Females are generally, but not always, smaller and about 10–15% less heavy than males, and the lengths of the crest and bill tuft of female Madagascar Crested and Aldabra Drongos are shorter than those of the males. The amount of gloss is often higher in males, as demonstrated by the Square-tailed, Hair-crested and Shining Drongos, and the plumage of females of the Aldabra Drongo is greyer than that of the male. These small differences can sometimes allow the identification of the presumed male or female of a particular pair during nesting.

The head is rather large, and is sometimes crested, with tufts of frontal feathers starting at the base of the bill and directed forwards and upwards, or sometimes curling backwards to form a large crest from just over the forehead to well beyond the nape. Typical examples are the Madagascar Crested, Sri Lanka Crested, Hair-crested and Greater Racquet-tailed Drongos. The greatest crest development is reached with the subspecies *grandis* of the Greater Racquet-tailed Drongo, which has fully webbed feathers of up to 66 mm, although some other races of this species completely lack the crest and have only small bristly feathers curling forwards over the culmen. In the case of the Hair-crested Drongo, these frontal feathers are webless hair-like filaments, and these, too, may be absent in a certain percentage of specimens of some races. For example, they are lacking in 50% of *guillemardi* and *pectoralis* specimens, and are totally absent in the taxonomically problematic forms *striatus* and *samarensis*.

Drongo bills are black and are almost always strong, and particularly broad and deep at the base, this being especially evident with the Crow-billed Drongo; the exception is the Bronzed Drongo, which has a depressed, flat bill. The drongo bill has an arched culmen, and is hooked at the tip, compressed and well notched for seizing and holding prey; well-developed rictal bristles are present at its base, possibly to protect the face from captured prey, and concealing slit-like nostrils. Internally, the nasal cavity is heavily ossified, and the palate is reinforced by an extended bony plate to allow handling and mastication of large insects with hard carapaces; powerful jaw muscles are attached to a large depression present in each temple. Bill length ranges from about 20 mm for the Sulawesi Drongo and 21–23 mm for the Square-tailed and Bronzed Drongos, and the nominate race of the Balicassiao, to 30 mm for the Crow-billed and Madagascar Crested Drongos, 32 mm for the Comoro Drongo and race *longirostris* of the Hair-crested Drongo, and 35 mm for the Mayotte Drongo. The iris is usually red or brown, but it may vary from orange to dark brownish crimson-red, or from dark brown to reddish-brown. The three races *faberi*, *jentincki* and *leucops* of the Hair-crested Drongo have a white iris. All immature drongos have a brown iris.

The wings of drongos are rather long and either rounded or somewhat pointed, and are well adapted for the swift flight and aerial acrobatics that drongos perform with great ease to capture insects in the air and amidst vegetation. The flight-feathers comprise ten primaries, including a well-developed outermost primary that is half as long as the next, nine secondaries, and a few tertials, the Spangled Drongo, for example, possessing three; one remicle is also present. Average wing lengths vary from the 107 mm of the Square-tailed Drongo and the 120 mm or so of the Pygmy and Shining Drongos, these three being smaller species, to approximately 130–150 mm for medium-sized drongos, and up to 184 mm for the largest drongos; the three longest-winged are the subspecies *megalornis* of the Hair-crested Drongo, with an average wing length of 175 mm, the race *grandis* of the Greater Racquet-tailed Drongo, with a corresponding figure of 180 mm, and the largest of all, the Ribbon-tailed Drongo, which has an average wing length of 184 mm. Migratory species or subspecies appear not to have longer wing lengths compared with resident ones.

All *Dicrurus* drongos have only ten tail feathers. The more primitive Pygmy Drongo, the sole member of the genus *Chaetorhynchus*, has twelve rectrices and a slightly rounded tail reminiscent of that of a fantail (see Systematics). For the genus



*The first major split in the 32-taxon "*Dicrurus hottentottus *superspecies complex" was made in 1986, with the distinction between* D. hottentottus, *renamed the* **Hair-crested Drongo**, *and* D. bracteatus, *which kept the name Spangled Drongo. These two species, with six others, may constitute a superspecies. The nominate race of the Hair-crested Drongo has hair-like feathers around 80 mm long springing from its forehead, and extending over its hindcrown and upper back. Among the 14 subspecies recognized herein, some have shorter frontal filaments, others like* samarensis *and* palawanensis *lack frontal filaments, while in yet others the hairs are present in some individuals and lacking in others. The irides of most drongos are varying shades of orange, red or brown, but the races* faberi, jentincki *and* leucops *of the Hair-crested Drongo have a white iris.*

[*Dicrurus hottentottus*. Photo: Tom & Pam Gardner/FLPA]

Dicrurus, the tail is normally deeply forked or slightly notched, but that of the Square-tailed Drongo is square-ended, that of the Mayotte Drongo is lyre-shaped, and the tails of the Ribbon-tailed and Hair-crested Drongos are twisted. Some species or subspecies have long, decorative, racquet-shaped outer feathers. The lengthening of the tail is considered to be an evolutional character accompanied by the deepening of the fork. Vaurie found that the depth of the tail fork is proportionately greater for species or races with a long tail, ranging from 1% of the tail length in the race *samarensis* of the Hair-crested Drongo, and about 7% in the Sumatran and Square-tailed Drongos, to 38% and 44% in the Tablas and Mayotte Drongos, respectively, and 60% in the Ribbon-tailed Drongo. Tail lengths are generally of the same order of magnitude as wing lengths, measuring typically 90–100% of the latter, the average ratio between the two varying between 80% and 120% for most forms. Notable exceptions are those of the Ribbon-tailed Drongo and both racquet-tailed drongos, which have very long tail feathers over 200% the length of the wing, the Mayotte Drongo, for which the figure is 140%, and some comparatively shorter-tailed forms from Vaurie's "*D. hottentottus* superspecies complex" (see Systematics). Of the last, the tails of the Sumatran Drongo and of the race *samarensis* of the Hair-crested Drongo were calculated as being about 70% the length of the wing; and the tails of races *striatus* of the Hair-crested and *abraensis* of the Balicassiao as being about 77%. The most spectacular modification of the outermost tail feathers is that in which the greatly elongated sections of the shafts are completely denuded of barbs until, near the tip, the inner web or both webs reappear and form a racquet-like pendant. This may be a relatively unstable character, as specimens with fully webbed outer feathers have been reported for several subspecies of the Greater Racquet-tailed Drongo, including the nominate race, *brachyphorus* and *platurus*; indeed, the outermost rectrices of the Sri Lanka Crested Drongo and the Ribbon-tailed Drongo are always fully webbed. Curling of the outermost tail feathers appears at its maximum with the Ribbon-tailed Drongo, the Greater Racquet-tailed Drongo and several races of the Hair-crested Drongo. Asymmetrical outer tail feathers, either malformed or broken, are sometimes recorded, and can be used as a means for individual recognition.

Drongos have relatively short legs, with a fully feathered tibia, and a stout tarsus scutellated at the front but smooth at the back, with strong and long toes and claws, all black. Being almost exclusively arboreal, these birds can perch at will and jump with agility from branch to branch; they do not normally, however, walk on the ground, although some species can occasionally be seen to forage there. Some species are able also to cling to tree trunks in the manner of a woodpecker (Picidae).

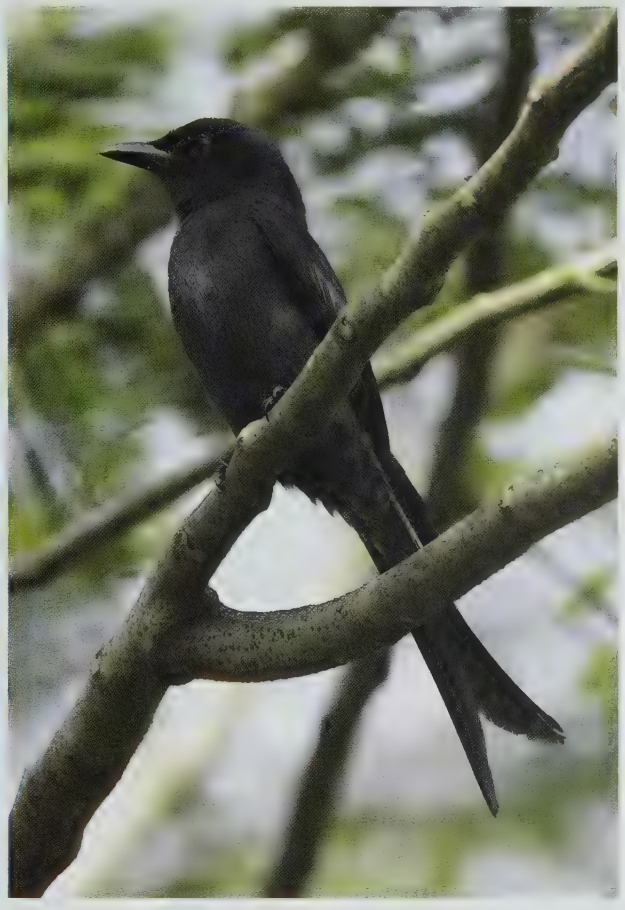
Plumage coloration of adult drongos is for most species dominated by blackish tones, with variable proportions of shining metallic glossy areas contrasting with velvety deep black parts. Glossy feathers can be found mainly on the mantle, wing and tail, as well as on the breast and neck and around the head, and they vary from greenish to bluish or purple. Velvety areas are mostly restricted to parts of the head, such as the forehead, chin and lores, the mantle, as with, for example, the Hair-crested Drongo, and, more rarely, the underparts, as in the case of the subspecies *coracinus* of the Velvet-mantled Drongo. The intensity, distribution and colour of the gloss and the extent of velvety parts across the body are key morphological differences separating the various species or races of drongos. Some body parts can be brownish, such as the flight-feathers and tail of the Comoro Drongo, or greyish, the Ashy Drongo having an exceptional grey-dominated plumage that is, in some races, very light in colour. Spotting of the plumage does not normally occur on adult drongos, except for a few species that have restricted white patches: the Pygmy Drongo has white on the scapulars; the Black Drongo has white at the base of the bill; and some races of the Ashy Drongo have white feathering around the eyes. Other species present larger white areas, such as the White-bellied Drongo, which has more or less extensive white depending on subspecies, and the race *mirabilis* of the Balicassiao. In Kenya, instances of abnormal white coloration on the belly and wings, or fully albinistic specimens with a pale bill and legs, have been described for the Fork-tailed Drongo. In such cases in which the intense black coloration has been lost, the gloss also has disappeared. Evolutionary modification of the feathers includes concentration of gloss into certain parts of specific feathers. This leads to the



The plumage of adult drongos is dominated by black, with variable proportions of shining metallic glossy areas contrasting with velvety deep black parts. The gloss on the crown, throat and upper breast of the **Spangled Drongo** *is limited to the tips and outer margins of the feathers, forming sharply defined oval or pointed spangles. The glossy feathers on the side of the neck are elongated, forming lanceolate hackles. Spangles and hackles are more or less well developed among the eleven subspecies. Juvenile and immature drongos have less glossy, more brownish or greyish plumage, with features like spangles and hackles less developed or absent.*

[*Dicrurus bracteatus*, Daintree, Queensland, Australia. Photo: David Stowe]





*The **Ashy Drongo** is exceptional among drongos in having grey-dominated plumage that is, in some races, notably pale in tone. The white-faced race* leucogenis *and dark race* longicaudatus *were formerly treated as two separate species. The 14 subspecies currently recognized are distributed widely over southern Asia. The subspecific taxonomy of the Ashy Drongo is complicated. Many races are not clearly differentiated while some intergrade, and in most of the mainland, the races are highly migratory.*

[Left: *Dicrurus leucophaeus stigmatops*, Kinabalu Park, Sabah, Borneo. Photo: Ong Kiem Sian.

Right: *Dicrurus leucophaeus longicaudatus*, Kedarnath Wildlife Sanctuary, Uttarakhand, India. Photo: Amano Samarpan]

formation of "spangles", when gloss accumulates at the tips of small, pointed breast feathers, as is typically the case with the Spangled Drongo, or to the formation of "hackles" in the long, narrow lanceolated plumes of the nape and hindneck, as with the Hair-crested and Wallacean Drongos and the Balicassiao.

Characters of individual species such as general size, pigmentation, body proportions and special structures, including crests and tail-racquets, vary geographically. It is interesting to note that these variations are not random, but are correlated with clinal environmental features such as temperature and humidity. As shown by Mayr and Vaurie in 1948, general size increases with latitude and altitude as a result of lower temperatures, as detailed in Bergmann's Rule, for six dicrurid species, including the Black, Ashy, Bronzed, White-bellied and Hair-crested Drongos; for the Greater Racquet-tailed Drongo, parallel decreases from north to south in general size, tail length and crest development are observed on both sides of the Bay of Bengal. Regarding intensity of pigmentation, which as a general rule tends to increase with humidity, at least four species, the Square-tailed, Fork-tailed and Hair-crested Drongos and the Balicassiao, have a denser, more bluish or purple gloss in the wettest parts of their ranges, and a less saturated, more greenish gloss in the drier areas. Similarly, White-bellied Drongos are darkest in the wet zone of Sri Lanka when compared with the races occurring in the dry zone of that island and in drier peninsular India. Island forms are frequently larger or smaller than the original continental forms, and the most distinctive forms are found at the periphery of the species' range or at very isolated locations.

Juvenile and immature dicrurids differ from adults mainly in having the plumage usually less glossy and less intensely coloured, more brownish or greyish, instead of black, with pale-barred or white-spotted underparts, and with whitish or buffy feather tips or fringes. In addition, they have a shorter and non-forked tail, and lack or have less well-developed ornamental feathers such as racquets and other modified outer tail feathers, crests, hackles and spangles. Particular immature plumages include that of the Pygmy Drongo, duller than the adult and with a white gape, that of the Black Drongo, which has a white rictal spot larger than the adult's, and that of the Shining Drongo, all sooty black with gloss only on the wing and tail. In the case of the White-bellied Drongo, the distinction between the browner throat and breast and the white belly is less visible on the immature than on the adult.

Drongos moult only once a year. Immatures may acquire adult plumage during their first year, after a first moult involving most or all feathers of the body, the Aldabra Drongo, for example, doing so before the start of the next breeding season. For some species, however, adult plumage is not acquired before the bird has entered its third year. Lesser Racquet-tailed Drongos in their first, juvenile, plumage have a slightly forked tail with no racquets, lack the frontal brush-like crest, have very restricted gloss, and have the axillaries broadly tipped with white. After their first moult, the outermost rectrices grow and have short shafts with traces of barbs and of terminal racquets, the frontal brush appears, and the plumage has more gloss and smaller white marks; this subadult plumage will be replaced after the second moult, when full adult plumage, with its longer outer rectrices and totally bare shafts, will appear. A similar succession of three plumages, those of juvenile, subadult and adult, is recorded for the Greater Racquet-tailed Drongo; the racquet feathers of the adult of this species are moulted asymmetrically. Adult drongos are known to moult every year, probably after breeding. This has been shown with the Spangled Drongo, the moult of which extends over a period of five months.

Habitat

The members of this family are found almost exclusively in tropical and subtropical ecosystems where trees are present. They occupy a large range of habitats, including primary, secondary and degraded broadleaf forests, both evergreen and deciduous, tree plantations, open woodland and savanna, forest edges, and such artificial habitats as urban gardens, residential areas and cultivated landscapes with isolated trees. Drongos are particularly fond of any openings in the vegetation, since all of these species need open areas in which to detect and hunt aerial insects. Some can



Molecular-genetic studies show that crests have little phylogenetic value, and can appear and disappear easily in the various lineages, in both ancient and recent forms of both Asian and African groups. The ***Madagascar Crested Drongo*** *has a tuft of elongated frontal feathers 20–40 mm long at the base of its bill, forming a slightly forward-curving crest. The crest is the main difference between this species and the otherwise almost identical Fork-tailed Drongo* (Dicrurus adsimilis), *which is widely distributed throughout the African mainland. Recent DNA studies indicate that the Madagascar Crested Drongo's closest relative is the Aldabra Drongo* (D. aldabranus), *which arose through colonization of Aldabra from Madagascar less than 125,000 years ago; this species has lost the tufted crest. A molecular study in 2007 indicates that the drongos on Indian Ocean islands do not form a monophyletic assemblage. The colonization of these islands by an ancestor of the "*D. adsimilis *group" seems to have occurred shortly after its arrival in Africa, and to have followed a complex pattern. The most ancient of these species is the Comoro Drongo* (D. fuscipennis), *which originated about five million years ago and appears to be the closest relative of the Fork-tailed and Velvet-mantled Drongos* (D. modestus). *As the estimated age of the island of Grand Comoro is only half a million years, this species must have originated from another, older island in this volcanic archipelago. It does not appear to be closely related to other drongo species from the Indian Ocean. The Mayotte Drongo* (D. waldenii) *appeared at around the same time and is as old as Mayotte itself, apparently having branched off from the ancestor of the Madagascar Crested Drongo. The race* potior *of the Madagascar Crested Drongo would have resulted from colonization of Anjouan in the Comoro Islands within the last 150,000 years.*

[*Dicrurus forficatus forficatus*, Mahajanga, Madagascar. Photo: Pete Morris]

live in very open habitats with only few isolated trees, whereas others are more typical woodland birds but have a preference for edges, gallery forest or trees overlooking roads or streams. Even those present in deep forest will still select clearings, created by falling trees or by small-scale human activities such as logging, forest houses or cultivation, possibly maintained by herbivores.

Comparative studies of habitat selection by the different drongo species are not available. Among the variety of ecological factors to which most species respond, however, the most important one seems to be the structure of the vegetation, and, more specifically, its degree of openness or artificialness, and sometimes the height of the trees. Accordingly, drongos can be classified in four main categories. These have been defined by positioning species along a gradient of vegetation openness and increased human influence, proceeding from primary to secondary forest, then degraded forest, open woodland, cultivated areas with scattered trees, and residential areas.

The first category consists of seven species that occupy almost exclusively deep mature primary or secondary forests. These are the Pygmy Drongo, Sulawesi Drongo, Sumatran Drongo and Ribbon-tailed Drongo, restricted to the respective islands of New Guinea, Sulawesi, Sumatra and New Ireland, the Tablas Drongo, confined to the relictual natural forests of the island of Tablas, in the Philippines, the Sri Lanka Crested Drongo, living in the dense humid forests of Sri Lanka, and the Shining Drongo, a denizen of the primary rainforests of West Africa and the Congo Basin.

Four species are combined in the second category, being found mainly, but not exclusively, in open wooded habitats with sparse trees. Two of them, the Fork-tailed Drongo and the Black Drongo, inhabit wooded savannas, plantations, cultivated landscapes and residential areas in Africa and Asia, respectively, while the White-bellied Drongo in India and Sri Lanka occupies a similar habitat but not agricultural land. The Endangered Comoro Drongo is localized in degraded woodland, plantations and agricultural areas at middle altitude on Grand Comoro, although its original habitat may have been different and could now have disappeared.

A third category is composed of eight typical forest species which, unlike those in the first category, are not restricted to mature dense forests. These eight exhibit a moderate niche extension with regard to open man-made habitats, being occasionally present in open degraded forest, although not normally in cultivated areas with sparse trees or in residential areas. They are the Mayotte, Square-tailed, Hair-crested, Crow-billed, Lesser Racquet-tailed and Bronzed Drongos, the Balicassiao and the Andaman Drongo. The ecology of the last two is still not well known.

Finally, the fourth category comprises six other species that have the largest amplitude of habitats, with an important niche extension with regard to man-made habitats. The habitats which they occupy range from primary and secondary forest to degraded woodland, plantations and open areas with scattered trees, including farmland. These are the Velvet-mantled and Wallacean Drongos, together with four species that are present also in residential areas and around villages, namely the Spangled Drongo, the Greater Racquet-tailed Drongo, the Madagascar Crested Drongo, and certain races of the Ashy Drongo.

The Aldabra Drongo represents a special case and cannot be placed into any of the above-mentioned four categories. Confined to the coralline atoll of Aldabra, in the Seychelles Group, it occupies the native shrubland, averaging 2–6 m tall and dominated by *Pemphis acidula*, which covers most of the atoll, and is found also in the coastal casuarina (*Casuarina equisetifolia*) open woodland and the mangroves that circle the lagoon.

Some drongos occupy particular breeding habitats. Examples are the deciduous forests of high-altitude subtropical climates present in China and along the Himalayan chain, which are utilized by the Crow-billed, Bronzed, Lesser Racquet-tailed, Ashy, White-bellied, Hair-crested and Black Drongos; the bamboo forests in China and South-east Asia, which host the Bronzed, Lesser Racquet-tailed, Hair-crested, Greater Racquet-tailed, Ashy and White-bellied Drongos; and mangroves, where the Aldabra, Spangled, Greater Racquet-tailed, Ashy, Crow-billed and Mayotte Drongos breed. Outside the breeding periods, some species may enlarge their habitat selection. This is the case, for example, with the Hair-crested and Crow-billed Drongos, which can be seen in parks and wooded gardens, tree plantations and mangroves during the non-breeding season and when making migratory or altitudinal movements.

Drongos can be found in a wide elevational range, from sea-level to approximately 4000 m. In general, they are common in



Drongos are highly territorial and generally live in breeding pairs. They are typically found alone, in pairs or in small family groups. However, occasional concentrations of up to 50 drongos can be found in suitable circumstances, such as at the mass emergences of ants, or at bush fires, which flush out insects. ***Black Drongos*** *are usually solitary, but will gather in numbers to feed on swarming winged termites or emerging mosquitoes. In the non-breeding season, some species, including Black Drongos, gather in large numbers at roosts.*

[*Dicrurus macrocercus albirictus*, Tal Chhapar Sanctuary, Rajasthan, India. Photo: Gaurav Bhatnagar]





*Drongos have been described by some authors as "little furies". They will attack animals much larger than themselves, such as monkeys or even humans. The **Fork-tailed Drongo**, here seen "bombing" a Tawny Eagle* (Aquila rapax), *can often be seen attacking and chasing crows or raptors, sometimes even pecking at them in flight while "riding" on their backs. Similar behaviour has been reported for the **Greater Racquet-tailed Drongo** when attacking a Great Hornbill* (Buceros bicornis).

[Left: *Dicrurus adsimilis apivorus*, Kgaligadi Transfrontier Park, South Africa. Photo: Rolf Kunz.

Right: *Dicrurus paradiseus paradiseus*, Khao Yai National Park, Thailand. Photo: Morten Strange]

lowlands and in middle-altitude forests below 1000 m, but many species can ascend to much higher levels. A majority of dicrurids do, in fact, have large altitudinal ranges, in line with the distribution of their suitable habitats and local climatic conditions, from sea-level woodlands up to, sometimes, the upper tree-limit. The only drongo species with restricted altitudinal ranges are those found on small low-lying islands. The species with the widest elevational range is the Ashy Drongo, which is present from sea-level to 3000 m in the Sunda Islands, and from 600 m to 4000 m in south China. Other Asian and Australasian species occupying large altitudinal ranges of about 2000 m include the Bronzed and Black Drongos in the Indian Subcontinent, and the Spangled Drongo in the Moluccas, while others, such as the Greater Racquet-tailed, Wallacean and Sumatran Drongos, do not go much higher than 1500 m. A few species, such as the Sulawesi Drongo and the Pygmy Drongo, display a clear preference for middle altitudes, the former being found from 600 m to 1800 m, and the latter mainly at 600–1400 m although present at lower densities down to 200 m and up to 1600 m. Some members of the family exhibit different altitudinal preferences according to subspecies or even local populations. Taking the Asian Lesser Racquet-tailed Drongo as an example, the subspecies *tectirostris* is found from the lowlands to 2000 m along the Himalayan chain, but is present mostly between 450 m and 750 m, whereas in Indonesia it is more clearly a mountain bird, found only at 600–2500 m and mostly between 1200 m and 1800 m; in the Malay Peninsula, the race *peracensis* occurs only above 450 m.

Two African species are found from sea-level to 2000 m and above, the Fork-tailed Drongo occurring at up to 2200 m in Kenya and the Square-tailed Drongo to 2100 m in Sudan. The Madagascar Crested Drongo, in Madagascar, and the Velvet-mantled Drongo, in Africa, are recorded to lower altitudes, 1900 m and 1600 m, respectively. Two other species, the Shining Drongo in the Afrotropics and the Comoro Drongo, are not recorded above 1000 m. Species confined to small islands occur generally across the entire altitudinal range of wooded habitats available; this is the case with the Aldabra Drongo, restricted to a low-lying coralline atoll rising to less than 18 m, and the Mayotte Drongo, found in all natural forests up to the island summit, at 660 m.

There are multiple examples of various drongo species co-existing in the same geographical area. Large islands can harbour several species, Borneo and Sumatra for example holding, respectively, four and five, and south-east China is host to as many as seven species, including five on Hainan alone. Some of these may differ in altitude occupancy or in habitat preferences, but some can also occur together in the same forests. The extent of overlap in habitat use and competition between different sympatric species has not, however, been sufficiently studied. New Guinea has two dicrurid species which are separated to some degree by altitude: the Pygmy Drongo, known also as the "Mountain Drongo", lives mainly above 600 m, whereas the Spangled Drongo occurs chiefly in the lowlands. The same occurs with the



*Drongos tend to be more active during the morning and late afternoon, the hot hours of the day being devoted more to comfort activities such as resting and preening. Although drongos are essentially diurnal, they are often described as the birds which remain active for longest at dusk, and are among the earliest to become active. The **Hair-crested Drongo** is associated with forest, although it tends to prefer clearings and forest edge. Generally found from the lowlands up to above 2000 m, in Sulawesi it favours montane forest, while the Sulawesi Drongo* (Dicrurus montanus), *despite its scientific name, occupies lower elevations, although the two species do overlap to some extent.*

[*Dicrurus hottentottus*, China. Photo: Dong Lei]



Once the sun is up, and the immediate demands of foraging have been satisfied, many birds will spend some time sunbathing, as demonstrated by this ***Spangled Drongo****. This activity may serve several purposes, one of which is a general toning up of the feathers, in case some of them have been twisted out of shape during the morning's work. Feather care can involve a number of processes, all of which are designed to keep them in tip-top condition, as a bird's livelihood and even life ultimately depend on this.*

[*Dicrurus bracteatus baileyi*, Kakadu National Park, Northern Territory, Australia. Photo: Oriol Alamany]

Sulawesi Drongo and Hair-crested Drongo on Sulawesi. In each of these examples, however, the two species involved also overlap in altitudinal range.

Sri Lanka has two perfect examples of a clear bioclimatic separation. First, the subspecies *insularis* of the White-bellied Drongo is restricted to the lowland dry zone, whereas race *leucopygialis* of this species is confined to the lowland wet zone; secondly, the subspecies *ceylonicus* of the Greater Racquet-tailed Drongo and the newly recognized Sri Lanka Crested Drongo, the latter previously treated as a race of the Greater Racquet-tailed (see Systematics), are similarly distributed. Details of the methods by which the two pairs of taxa manage to co-exist in the forests of each bioclimatic region deserve investigation. The same applies to the Greater and Lesser Racquet-tailed Drongos, the distributions of which frequently overlap in the lowlands; they are often reported as foraging side by side in the same mixed-species associations in India, but they tend to exclude each other in Thailand and Myanmar.

In the Congo Basin of central Africa, the Square-tailed Drongo is found almost exclusively in the upper canopy of primary forests, while the Shining Drongo occupies mainly the lower strata below 20 m. In contrast, in secondary forests where the latter species is absent but where the Fork-tailed Drongo occupies the upper strata, the Square-tailed Drongo is then found mainly in the understorey, below 15 m. This example illustrates the important ecological plasticity of some drongos, a character probably common to the majority of species that have been able to adapt to a large range of man-modified habitats. The fact that some species are able to mould their own ecological niche in relation to the presence of other, competing drongos probably explains how three or more congeneric birds as aggressive and territorial as these can live together in the same habitat type.

General Habits

Drongos are medium-sized arboreal insectivores. Typically perched on a branch, or sometimes on a wire or pole, they are easily recognizable by their characteristic slim upright posture, the long tail hanging almost vertically, as they look out for insects from an exposed vantage point. Their aerial movements are remarkable, and may involve the birds hovering, springing up vertically, swooping down to the ground, and performing a slalom through the vegetation before looping back to the perch.

They are generally found alone, in pairs or in small family groups. Only one species, the Andaman Drongo, which forages in groups of up to 20 individuals, can be said to be regularly gregarious, although occasional concentrations of up to 50 birds of other species can be found in favourable circumstances, as at mass emergences of ants (Formicidae) or at bush fires, which flush out insects (see Food and Feeding). Most drongos readily associate with other animals, exploiting the prey they disturb.

The members of this family are very noisy and vocal birds, their loud voice, with typical harsh scratchy notes, making them easily detectable in the field. They are typically forest-dwellers, although many species have adapted to more open or semi-open wooded habitats created by man (see Habitat). A few of them are found in cultivated landscapes, where they may perch on the backs of domestic cattle, and some thrive even in suburban parks and gardens.

Although dicrurids are more or less exclusively diurnal, many hunt also during crepuscular hours, far into the dusk. Sometimes they are active several hours after dark, taking advantage of food in the form of insects attracted by artificial lights to the vicinity of houses and to suburban areas (see Food and Feeding). As with many other forest birds, however, drongos tend to be more active during the morning and the late afternoon, the hot hours of the day being devoted more to comfort activities such as resting and preening. They are often described as being the bird species which remain active for longer at dusk and as being among the earliest to become active in the morning, at or before dawn. Indeed, some dicrurids start to sing and display long before dawn, while it is still quite dark, or continue to sing into the night during moonlit nights. The parents and their young offspring will usually roost close to each other at night, especially when the young have only recently fledged. In the non-breeding season, some species, such as the Black Drongo, gather in large numbers at roosts.

Highly territorial, drongos generally live in breeding pairs, the members of which perform various displays (see Breeding). Some species, such as the Spangled Drongo, perform spectacular flight displays throughout the day, even when not breeding. Several members of the family offer a leaf to the mate during



While harsh elements are prominent in the songs of many drongos, a few species, such as the ***Balicassiao****, have songs and calls dominated by melodious warbling and high-pitched liquid twittering. The Balicassiao is one of 14 drongo species in which duets between partners have been recorded. They also sing collectively, in parties of three to four, as if in competition. Drongos usually sing from an exposed perch; they rarely do so in flight, except as part of an aerial display. They are often the earliest birds to begin singing. They sing during the day and with greater intensity at dusk, sometimes for several hours after sunset or during moonlit nights. They are well known for their ability to mimic other birds.*

[*Dicrurus balicassius*, Zambales, Luzon, Philippines. Photo: Doug Wechsler/ VIREO]

courtship (see Breeding), but some drongos will at times use leaves also in play, as was reported for two juvenile Black Drongos. One of the juveniles repeatedly picked up a leaf and dropped it deliberately, while the other juvenile would plunge to catch the leaf with its beak or claws before it touched the ground.

One of the most typical characteristics of drongos is their notorious aggressiveness, exemplified by their remarkable boldness in attacking other animals much larger than they themselves are. They will attack, among others, crows, birds of prey (Falconiformes) up to the size of large eagles, and monkeys and other mammals, including humans, and they seem, when defending the nest, not to be deterred by the size of any potential predator (see Breeding). Mobbing and aggressive behaviour, however, is not always linked with breeding. Recent research on the Black and Ashy Drongos in Indonesia has shown that the intensity of such behaviour does not differ significantly for the dangerous Indian Black Eagle (*Ictinaetus malayensis*) and the relatively harmless Javan Hawk-eagle (*Spizaetus bartelsi*), and increases during the breeding season only for the latter. This may be an adaptive strategy to ensure that dangerous predators do not use mobbing intensity as a clue to the presence of a drongo nest. The Black Drongo has also been reported mobbing and chasing Common Black-shouldered Kites (*Elanus caeruleus*), as well as House (*Corvus splendens*) and Large-billed Crows (*Corvus macrorhynchus*); and the Fork-tailed Drongo is known to mob raptors and other predators, including reptiles such as water snakes.

Amazingly, the African Fork-tailed Drongo and its closely related Asian counterpart the Black Drongo have been repeatedly observed to attack and chase crows, Short-toed Snake-eagles (*Circaetus gallicus*) and Black Kites (*Milvus migrans*), pecking at them in flight while "sitting" or "riding" on the back of the predator. The same behaviour has been reported also for the Greater Racquet-tailed Drongo when attacking a Great Hornbill (*Buceros bicornis*). Described by some authors as pugnacious "little furies", irascible and quarrelsome, dicrurids have been observed to mob and attack other large birds that are apparently harmless but are possibly identified by the drongo as potential egg predators, as, for example, when a Greater Racquet-tailed Drongo attacks a Great Hornbill or a Large Frogmouth (*Batrachostomus auritus*).

The flight of drongos is normally silent, and the wingbeats are often punctuated with very brief pauses when moving from one place to another. Exceptions to this are provided by certain long-tailed species, particularly those having two long tail-filaments with racquets flapping at the end like two small flags, which have a noisy flight, detectable by ear from a long distance. The sound produced by the Greater Racquet-tailed Drongo in flight is like humming, and the racquets give the impression that the bird is being pursued by two dark bees. The splendid tail possessed by many drongos represents a characteristic visual and sometimes acoustic signal for the human observer, and it must obviously play an important role in intraspecific or interspecific recognition.

Drongos do not have a strong association with water. They may be able, as are other forest birds, to drink rain from foliage or from pits or depressions in tree branches or trunks, but this behaviour has hitherto been reported only for the Spangled Drongo, which occasionally drinks from tanks or forest pools. As other highly aerial and short-legged birds do, drongos may occasionally drop or plunge-dive from a few metres into a pool of water or into a river to bathe for a brief moment. This behaviour has been reported for eight species: the Black, Hair-crested, Greater Racquet-tailed, Lesser Racquet-tailed and Bronzed Drongos in Asia, the Spangled Drongo in Australasia and New Guinea, the Fork-tailed Drongo in Africa and the Madagascar Crested Drongo in Madagascar. Other bathing techniques include rain-bathing, by perching with spread wings in the falling rain, and foliage-bathing, both recorded for the Crow-billed Drongo in Thailand.

Few ectoparasites have been reported on drongos. Feather mites such as *Calamicoptes zumpti* (Laminosioptidae) have been found on the Fork-tailed Drongo, and several species of philopterid lice (Mallophaga) have been identified on the Black Drongo. Internal parasites appear to be more frequent, and these include a variety of nematodes, such as *Viguiera majumdari* and *Viguiera adsimilisai*, and cestodal tapeworms, such as *Parutirena dicruri* and *Notopentorchis kherai*, found in Black Drongos,



Bronzed Drongos *are sometimes seen perching on roadside fences, electricity poles or wires, to take advantage of insects disturbed by passing cars or landing on the bare road surface. Drongos are very efficient hunters, and use a variety of techniques to capture their prey. The Bronzed Drongo hunts in the canopy, including the crowns of giant emergent trees, in clearings or at the forest edge, and also on the edges of cultivated areas. It hawks winged insects, making short sallies, and often swooping close to the ground, then looping back to the same perch. It also makes vertical sorties from treetops, diving back with the wings closed after a capture.*

[*Dicrurus aeneus aeneus*, Jiouliao, Yilan, China. Photo: Yung-Fu Chen]



Black Drongos *are often found accompanying livestock, the object being to capture insects displaced by them, or attracted by them. The same association has been reported in Pakistan for the Ashy Drongo* (Dicrurus leucophaeus). *These two drongo species will occasionally perch on the animals as they move, and in Sri Lanka, Black Drongos have been observed to eat ticks (Ixodoidea) directly from the backs of mammals. Black Drongos also join parties of Yellow-billed* (Turdoides affinis) *and Jungle Babblers* (T. striata), *and Jungle* (Acridotheres fuscus) *and Common Mynas* (A. tristis), *hawking insects flushed by these near-ground foragers, and in exchange, providing warning of predators. The Black Drongo is a bird of open country and farmland, rarely entering closed tree cover during the daytime, and often foraging far from any trees. It perches on wires, fence posts, bare treetops, earth banks or other vantage points, sallying to catch prey on the wing or among the leaves, or to snatch insects from the ground. Large items, such as locusts or cicadas, are held down with one foot and progressively torn to pieces with the bill. The wings are generally removed before the prey is swallowed. One Black Drongo, observed while eating a large locust, first made a small jump, while still holding its prey, in order to detach one leg, which it then tore up and swallowed. It repeated the operation with the other legs, and finally removed the head and, after some mastication, swallowed what remained of the body. Black Drongos will also follow human farm workers, pouncing on invertebrates disturbed or exposed by the plough. They are regularly reported pirating worms and other prey from Hoopoes* (Upupa epops), *mynas and wagtails* (Motacilla).

[*Dicrurus macrocercus macrocercus*, Tamil Nadu, India. Photo: Hanne & Jens Eriksen]





In Africa, the ***Fork-tailed Drongo*** *forages in close association with livestock, including dogs and chickens, and with large game, mainly African elephants* (Loxodonta africana), *but also African buffaloes* (Syncerus caffer), *giraffes* (Giraffa camelopardalis), *greater kudus* (Tragelaphus strepsiceros), *and chacma baboons* (Papio ursinus). *As well as using these large animals as beaters, the drongos may remove ticks and other ectoparasites from their hide, ears and nostrils. The* ***Black Drongo****, with which the Fork-tailed forms a superspecies, has also been observed to do this. This relationship, from which both bird and mammal benefit—the mammal by relief from discomfort and the removal of a potential disease vector—represents a limited but interesting form of symbiosis. Several drongo species, including Fork-tailed and Black Drongos, will accompany monkeys or squirrels (Sciuridae) in order to capture insects disturbed by them. A similar association has been noted for some species with a variety of other animals, ranging from tortoises to ants.*

[Above: *Dicrurus adsimilis fugax*,
Lake Manyara National Park, Tanzania.
Photo: Brian J. Coates.

Below: *Dicrurus macrocercus albirictus*,
Bandhavgarh National Park, India.
Photo: Jean-Pierre Zwaenepoel/naturepl.com]

Mayhewia in the Ashy Drongo, and trematodes of the family Dicrocoeliidae. In addition, the presence of Haematozoa has been reported in several drongos from Africa and Asia, and include *Haemoproteus dicruri* and *Haemoproteus khani* in the Madagascar Crested Drongo. The incidence of such parasites in drongo populations is not known.

Voice

Drongos are very vocal and noisy birds. The intrinsic muscles of the dicrurid syrinx are attached to the end of the bronchial semirings and they produce an astonishing variety of sounds, including mimicry of many other species. Generally speaking, drongos sing very well and have an extraordinary repertoire, some of the species seeming almost like true virtuosi. Few detailed studies have been made on drongo vocalizations. Some rather brief descriptions of song types and calls have appeared in the literature, and there are several unpublished recordings in the "Wildlife sounds" section of the British Library Sound Archive; more detailed account can be found in *Birds of South Asia*, by Rasmussen and Anderton, and in volume VI of *The Birds of Africa*, edited by C. H. Fry, S. Keith and E. K. Urban. Certain drongo forms, especially those recently elevated to species rank, have poorly known songs and calls which merit further investigation and description; this applies to, for instance, the Tablas, Sulawesi, Sumatran and Wallacean Drongos.

Calls given by this family consist generally of repeated short strophes of five or six syllables. They can be repeated a great number of times for up to five minutes, and even longer in particular circumstances; alarm calls, for example, are uttered persistently when drongos mob potential predators around the nest. The diversity of calls reported from drongos is huge, ranging from harsh scratchy notes, squeaks and shrill nasal buzzing, churrs and discordant sounds to loud ringing or twanging metallic notes, rolled gravelly sounds, and disyllabic or trisyllabic musical whistles with chopped notes, upslurs or downslurs. Examples of simple calls include the Tablas Drongo's typical rasping call, 2–3 seconds long and like the sound made by a cicada (Cicadidae); the long dry buzzes and sweet short whistles uttered by the White-bellied Drongo; and the whistles of several similar notes, or rolling sounds dropping into low deep twangy notes, given by the Ribbon-tailed Drongo. More complex calls include the rapidly repeated identical short whistles, or a creaky note followed by a double fluty one, given by the Greater Racquet-tailed Drongo; and harsh and metallic sounds alternating with whistles, or short fluty calls and long descending churrs, emitted by the Spangled Drongo. Some calls made by members of the family are quite amazing, examples being the sounds like that of tearing paper or the grinding of unoiled wooden wagon wheels, reported for the Fork-tailed Drongo. The latter also gives specific scratchy calls of several syllables before attacking raptors. Many drongo species flare the tail when calling.

Drongo songs are sometimes described as being a jumble of melodious whistles, squeaks and harsh notes. As with calls, songs can be composed of different sound elements of all kinds, sometimes juxtaposed in strophes of varying lengths, in which calls elements are often recognizable. Song types of particular species are generally varied, and may include, for example, low-pitched melodious sounds, sharp fluty or metallic whistles, rising or descending tones, rapid cascades of clipped notes, jumbled outbursts, and rasping or discordant sounds, often given in repetitive phrases. Such varied and contrasted vocalizations are probably one of the most important characteristics of drongo songs. While harsh elements appear to be prominent in the songs of many species, such as the Spangled and Mayotte Drongos or, to a lesser extent, the Greater Racquet-tailed, Fork-tailed, Black and Madagascar Crested Drongos, a few others, such as the Balicassiao and the Wallacean, Bronzed and White-bellied Drongos, appear to have much softer songs and calls dominated by melodious warbling and high-pitched liquid twittering reminiscent of the sounds made by small passerines, such as some finches (Fringillidae), Old World warblers (Sylviidae), thrushes (Turdidae) or larks (Alaudidae). Compared with other drongos, the Balicassiao and the Lesser Racquet-tailed Drongo, which have remarkably extensive repertoires, together with the White-bellied Drongo, which has the sweetest song, may be considered to be the most pleasing singers to the human ear. The songs of some other dicrurids, such as the Fork-tailed, Black, Crow-billed and Ashy Drongos, are sometimes described as being quite pleasant.

Duets have been recorded for at least 14 species of drongo, nine of these in Asia and Australasia and five in Africa and the



Drongos have relatively short legs, and do not normally walk on the ground. However, the habit of feeding on ground-dwelling prey has been reported for several species, among them Fork-tailed (Dicrurus adsimilis), *Spangled* (D. bracteatus) *and* ***Black Drongos****, especially young birds with limited aerial-hunting skills. The only invertebrates other than insects taken in significant quantities are spiders (Araneae), millipedes (Diplopoda) and earthworms (Oligochaeta). Occasionally, mainly in the Indian Subcontinent, the Black Drongo's diet may include lizards, small bats, and nestlings and even small birds. A Black Drongo has even been reported feeding on dead fish floating on muddy water.*

[*Dicrurus macrocercus albirictus*, Chitwan, Nepal. Photo: Neil Bowman/FLPA]



*Drongos feed mostly on large flying insects, but as this **Bronzed Drongo** shows, smaller winged insects, such as termites (Isoptera), dipteran flies and ants, wasps and bees (Hymenoptera), may also feature in the diet. They may capture these smaller insects by hovering in the manner of a muscicapid flycatcher. After a catch, carrying the prey in the bill or, in the case of large items, in the claws, drongos invariably move to a perch. Small food items are generally swallowed immediately. When dealing with bees or wasps, some drongos wipe the item against a branch to remove the sting, or, after returning to the perch, peck off the sting while holding the prey in the claws.*

[*Dicrurus aeneus aeneus*, Jiouliao, Yilan, China. Photo: Yung-Fu Chen]

Indian Ocean islands. Pair-members of the Fork-tailed Drongo, for example, give performances lasting 4–5 minutes and consisting of brief duets of 12–20 rapidly alternating elements of 25 to 300 milliseconds each. These elements are sung by each partner in a non-random sequence involving a complex correlation between the two birds, although one individual appears to dominate the duet with its own programme; the answering time of the partner is about 200 milliseconds. In Gabon, Square-tailed Drongo pairs perform quiet but rapidly delivered territorial duets, combining short whistles and continued chattering of liquid notes, including clicking sounds such as "tec-why-tyee" or "piu-took-why-tyee", from the male, to which the female gives harsh nasal replies. Mayotte Drongos sing remarkable duets throughout the breeding season at different points in the territory, especially in the vicinity of the nest. This species' song is a harsh repetitive jumble of chirps and squeaks, with syncopated loud whistles and harsh nasal notes rapidly alternated with creaky squawks and grinding sounds, but a low, soft and continuous whistling chatter is sometimes audible at close range. The male calls "chu-chi", the female responds with "chu" and the male ends with "chit", all of which is repeated rhythmically by both birds, each bobbing its head and body vigorously up and down in rapidly alternating turn, the two facing and almost touching each other, in a powerful vocal and dancing display. Spangled Drongo pairs are known to duet or jangle in unison. On Buru, in the Moluccas, one partner gives soft low whistles at long intervals, and when duetting utters longer crescending rolling "rurrrrrru" calls and high-pitched trills, answered with three or four slightly rising short whistles. In Australia, during its flight display, this species' distinctive song consists of five or six single notes given in series during the aerial descent and ceasing when the bird reaches about 3 m above the ground; the drongo may also produce a discordant jangle before the display and during the ascent phase, followed by a flow of rapid sharp twittering during the descent. Greater Racquet-tailed Drongos likewise perform duets; in Kerala, in southern India, one partner starts with a sharp double rising note, the other answering with a low-pitched whistle, and so on. Duets have been recorded also for the Shining Drongo in tropical Africa, for the Comoro Drongo on Grand Comoro, and, in Asia and Australasia, for the Balicassiao and the Sulawesi, Bronzed, Tablas, Crow-billed, Ashy and Black Drongos.

Collective singing, involving more than two individuals, has been reported for several species, including, occasionally, the Black, Bronzed and Ashy Drongos. On Luzon, in the Philippines, Balicassiaos will sing in parties of three or four individuals for long periods, as if engaged in a competition of vocalizing performances, producing an extraordinary variety of repeated short phrases, including melodious whistles sometimes reminiscent of those of a thrush or a sylviid warbler, repeated nasal notes, chuckling and rolling sounds, plaintive calls, and twangy or grinding notes, but with no harsh squeaks, jumbles or grating tones. Spangled Drongos, too, are known to sing in chorus, at times of up to 20 birds.

Within a single species, the vocal repertoire may vary considerably according to race or geographical area, as is the case with, for example, the Greater Racquet-tailed Drongo, and in particular with forms related to the "*D. hottentottus* Hair-crested Drongo complex", for which voice may be used also to investigate taxonomy (see Systematics). For the Square-tailed Drongo, differences exist between West Africa and East Africa, individuals being more silent in the former region. Cases of island differentiation include, for example, the Tablas Drongo, which has significantly different vocalizations from those of neighbouring related forms. Similarly, the typical vocalizations of the drongo present on the island of Príncipe include a loud and hoarse call, unmusical and dissonant, lacking in related forms on the African mainland.

Usually, drongos sing from a well visible perch, often a branch, but some species living in artificial habitats, such as the Black Drongo, will make use also of fences, electric wires and buildings. Drongos rarely sing in flight, except when this is part of an aerial display, as is the case with the Spangled Drongo. One Fork-tailed Drongo was reported singing while bathing. Drongos start to sing before dawn (see General Habits), sometimes up to two hours before, as is the case of the Black Drongo; they will sing during the day and with additional intensity at dusk, sometimes continuing for several hours after sunset or during moonlit nights, as do the Fork-tailed and Bronzed Drongos. Indeed, these birds are often said to be among the first to rise and the last to go to roost. They are very noisy and demonstrative throughout the breeding season, but much less so at other times. During the winter months, some members of the family, such as the Spangled Drongo, continue to give short subsongs.

Drongos are well known for their excellent ability to mimic other bird species. They have been noted as imitating members of numerous passerine families, including: pittas (Pittidae); larks; cuckoo-shrikes (Campephagidae); bulbuls (Pycnonotidae); fairy-bluebirds (Irenidae); ioras (Aegithinidae); thrushes, including chats and relatives in the subfamily Saxicolinae; Old World flycatchers; Old World warblers; babblers (Timaliidae); honeyeaters (Meliphagidae); Old World orioles; bush-shrikes (Malaconotidae); helmet-shrikes (Prionopidae); vangas (Vangidae); butcherbirds (Cracticidae); starlings; and cardueline finches. In addition, they have been reported to imitate woodpeckers (Picidae) and hornbills (Bucerotidae) in Asia; two species of cuckoo (Cuculidae), one in India and the other in Madagascar; various raptors in both their Asian and African ranges; and at least one species of owl (Strigidae). They use this talent to integrate themselves into mixed-species flocks, learning specific alarm calls from other species in order to get closer to them for foraging, and notifying the presence of predators. During these feeding parties, drongos occasionally give false alarms in order to distract other flock-members and steal their prey (see Food and Feeding). They also imitate introduced bird species, as well as domestic animals such as cats and even short tunes whistled by human beings.

Food and Feeding

Drongos are mainly insectivorous, but some species will also take small vertebrates and certain vegetable items. They feed on



Three different drongo taxa are known to perch vertically on tree trunks in the manner of a woodpecker (Picidae), with the head upwards and the tail against the bark, when capturing ants and other insects. The three are the race leucops *of the* ***Hair-crested Drongo****, the Andaman Drongo* (Dicrurus andamanensis)*, and the subspecies* viridinitens *of the Sumatran Drongo* (D. sumatranus)*. In fact, this behaviour may be more widespread, as suggested by this Hair-crested Drongo of the race* brevirostris*, which breeds in central and southern China. On the island of Siberut, the Sumatran Drongo has been recorded feeding in this way for up to 30 seconds. Woodpeckers are absent on Siberut, and Sulawesi and the Andamans have only two woodpecker species. Drongos may therefore be able to occupy part of the woodpecker niche.*

[*Dicrurus hottentottus brevirostris*, Dongzai National Nature Reserve, Henan, China. Photo: Dong Lei]



Nine drongo species are known to be regular consumers of nectar or pollen. The ***Ashy Drongo*** *regularly visits the silk cotton or cotton tree* (Bombax ceiba)*, as here; it also uses* Erythrina *blossom, as well as introduced* Grevillea *and* Eucalyptus. *Nectar, and sometimes pollen, appears to represent an important part of the diet of the Hair-crested Drongo* (Dicrurus hottentottus) *throughout continental Asia, although nectar consumption has not been reported for any of its island races. Some drongos may also visit nectar-rich flowers because of the insects they attract. Drongos may act as pollinators of certain flowering trees. When they have fed on nectar, the forehead and throat feathers may become covered with pollen.*

[*Dicrurus leucophaeus longicaudatus*, Goa, India. Photo: Jussi Vakkala]

a remarkable variety of prey, mostly large flying insects such as grasshoppers (Acrididae), cicadas, beetles (Coleoptera), hornets (*Vespa*), mantises (Mantodea), dragonflies (Odonata), and moths and butterflies (Lepidoptera). Smaller winged insects, such as termites (Isoptera) and ants, wasps and bees (Hymenoptera), mosquitoes (Culicidae) and other dipteran flies, and large homopteran or heteropteran bugs have also been found in stomach contents, as have caterpillars, pupae and other larvae. Some unwinged insects, including crickets (Gryllidae), stick-insects (Phasmida) and water-beetles, are also captured. The only invertebrates other than insects taken in significant quantities are spiders (Araneae), millipedes (Diplopoda) and earthworms (Oligochaeta).

Occasionally, dicrurids capture and feed on small vertebrates, and this has been reported for at least eight drongo species. Examples include Hair-crested, Black and Aldabra Drongos being seen to take skinks (Scincidae) or geckos (Gekkonidae); the Madagascar Crested Drongo preying on chameleons (Chamaeleonidae); Greater Racquet-tailed Drongos preying on frogs; Ashy, Spangled, Fork-tailed and Black Drongos feeding on small birds, including nestlings; and Black and Spangled Drongos killing and eating small bats. In addition, the Black Drongo has been seen to take dead fishes, and the Fork-tailed Drongo sometimes catches small living fishes by swooping from a perch, hovering low over the water and dipping its bill beneath the surface.

Nine species are known to be regular consumers of flower nectar or pollen. These are the Hair-crested, Ashy, White-bellied, Greater Racquet-tailed, Bronzed, Spangled, Fork-tailed, Square-tailed and Black Drongos. At least five members of the family occasionally take other vegetable items. Spangled, Comoro and Madagascar Crested Drongos will at times feed on fruits, Black Drongos on sorghum grains, and Velvet-mantled Drongos on bits of bark.

Large insects, up to 40–60 mm in length, can represent a predominant part of the diet. In observations in humid natural forests on Mayotte, in 2002, cicadas represented up to 47% of the food items brought to the nest by adult Mayotte Drongos, the remainder consisting of spiders, butterflies, wasps, grasshoppers and caterpillars in smaller proportions. Flies, beetles and millipedes were found in stomach contents of this species during previous studies. An analysis of the stomach contents of 19 Black Drongos, carried out in 1992 by the Bangladesh Rice Research Institute, revealed a diet composed of 49% phytophagous insects, along with 35% predaceous insects and 16% others; of the total, 22% were grasshoppers and 20% dragonflies. Invertebrate groups recorded in the diet of the Spangled Drongo, one of the most well-studied dicrurids, include earthworms and a wide variety of insects, among them termites, Orthoptera, cicadas, Neuroptera, beetles of the families Cerambycidae, Chrysomelidae, Scarabaeidae and Tenebrionidae, bees (Apidae) ants and vespid wasps, nymphalid butterflies, noctuid moths, dragonflies and stick-insects. On the island of Siberut, the Sumatran Drongo has been observed to take ants of the genus *Iridomyrmex* from the trunks of trees.

In India, Black Drongos occasionally capture small birds, in the region of about 10 g in weight. These include Oriental White-eyes (*Zosterops palpebrosus*), ioras, *Muscicapa* flycatchers, Streak-throated Swallows (*Petrochelidon fluvicola*) and prinias (*Prinia*), the last also reported as taken by this drongo in Hong Kong. Most of these incidents of preying on small birds occurred during the cold season, at a time when insects are scarce and drongos may be driven more to find other food sources with a higher energy value. The capture of small birds, in this case ioras and sylviid warblers, has been reported for the Ashy Drongo, too. In Australia, Spangled Drongos occasionally feed on the young or the adults of honeyeaters, including the Graceful Honeyeater (*Meliphaga gracilis*), the Yellow-faced Honeyeater (*Lichenostomus chrysops*) and the Dusky Myzomela (*Myzomela obscura*); in addition, they have been recorded as taking Scaly-breasted Munias (*Lonchura punctulata*), House Sparrows (*Passer domesticus*), Zebra Finches (*Taeniopygia guttata*), thornbills (*Acanthiza*) and pardalotes (*Pardalotus*). In Africa, similar predatory behaviour involving small birds has been reported only for the Fork-tailed Drongo. This species has been seen to prey on Bronze Mannikins (*Lonchura cucullata*), Yellow-fronted Canaries (*Serinus mozambicanus*) and white-eyes in various parts of its range in that continent.

In west Madagascar, the Madagascar Crested Drongo is observed occasionally to feed on the fruits of the arofy tree (*Commiphora guillaumini*), and has been identified as being a

seed-disperser for this tree. In Malaysia, the Greater Racquet-tailed Drongo occasionally takes figs from fruiting banyans (*Ficus*). Nectar and, sometimes, pollen appear to represent an important part of the diet of the Hair-crested Drongo in the whole of its distribution in continental Asia, although such consumption has not been reported for any of this species' insular races. At Dehra Dun, in north India, this drongo has been recorded feeding on the nectar of 22 different species of tree, especially *Erythrina indica*, *Delonix regia*, *Butea monosperma* and *Bombax ceiba*, and recommendations have been made to keep a significant proportion of flowering trees for nectar-feeding birds in tree plantations, managed forests and recreational areas. Spangled Drongos in Australia sometimes feed on fruits, as well as on the nectar from at least six different tree species, including the genera *Erythrina*, *Eucalyptus*, *Grevillea* and *Banksia*. Classed as omnivorous, this species has been seen to take household foods such as cheese, bread, raw sugar and meat, including animal fat and bone.

Drongos are very efficient hunters, and use a variety of techniques in order to capture their prey. They watch from a prominent perch, and sally or dart out to seize large flying insects such as locusts, cicadas or beetles in the air, before diving back on closed wings to the perch. They will also glide down and sometimes pursue prey, even slaloming between vegetation, as well as hovering to catch smaller insects, such as flies or bees, in the manner of a muscicapid flycatcher or swooping close to the ground for emergent ones, such as flying ants or termite alates. They normally use the bill as a means of capturing aerial insects, although the claws are sometimes utilized in the manner of an *Accipiter* hawk.

Non-aerial feeding is also very important for several species, the Hair-crested and Ribbon-tailed Drongos being two examples, and it can sometimes represent the most frequent method of capturing prey, as is the case with the Spangled and Mayotte Drongos. This last species obtains food items by pecking at the surface of trunks, branches, leaves or flowers, or catches items with its claws by pouncing on trunks and branches, as when seizing cicadas, or by pouncing on items on the ground. The Tablas Drongo has been described as foraging in vine tangles in the manner of coucals (Cuculidae); during this exercise, the drongo hung by one of its feet to the vine, held a dead leaf with the other foot, and used its bill to strip out insects. The habit of feeding on ground-dwelling prey has been reported for several species, among them the Fork-tailed, Black and Spangled Drongos, and especially for young birds with limited skills in flying and aerial hunting, as exemplified by the Aldabra Drongo.

Three different drongo taxa, namely the Andaman Drongo, the subspecies *viridinitens* of the Sumatran Drongo and the race *leucops* of the Hair-crested Drongo, are known to perch on vertical trunks in the manner of a woodpecker, with the head upwards and the tail against the substrate, when capturing ants and other insects; on the island of Siberut, the Sumatran species has been recorded feeding in this way for up to 30 seconds. Such behaviour has been reported for drongos living on islands where woodpeckers are either absent or uncommon, and where drongos may, therefore, be able to occupy part of the woodpecker niche. Woodpeckers are absent on Siberut, and north Sulawesi and the Andamans have only one and two woodpecker species, respectively.

Drongos hunt from a wide variety of trees, creepers and dead wood and utilize all vegetation strata, from low shrubs up to the top of tall trees at 30 m, and probably above. Some members of the family hunt more frequently in lower and middle levels, whereas others seem to prefer the higher canopy. As examples, the Shining Drongo hunts at 5–20 m in Gabon and the Mayotte Drongo even lower, at 2–6 m; in contrast, the Velvet-mantled Drongo prefers to forage above 25 m in Liberia and at 15–30 m in Gabon, and the Spangled Drongo at 10–25 m in Australia. Most drongo species appear not to have any particular preferences for trees rich in invertebrates; rather, trees and bushes used for foraging seem to reflect the actual vegetation composition of the habitat. This is the case especially for those species well adapted to degraded wooded habitats and man-made cultivated landscapes, such as the Fork-tailed, Velvet-mantled, Black, Madagascar Crested and Spangled Drongos. For the Mayotte Drongo, a forest species showing only limited adaptation to man-altered habitats, the huge diversity of vegetation used for foraging includes many introduced or cultivated trees, among them the invasive *Litzia glutinosa* and the mango tree (*Mangifera indica*). Blossoming trees certainly attract nectar-feeding species, as *Bombax ceiba* does with the Hair-crested Drongo, but also species that are not particularly nectarivorous, such as the Mayotte Drongo, as the



Like other forest birds, drongos may be able to drink rain from foliage or from pits or depressions in tree branches or trunks, but this has hitherto been reported only for the ***Spangled Drongo****, which in New Guinea has been observed drinking water from a forest pool during the dry season, as in this picture. Drongos may be attracted to water to hunt flying insects, in the manner of swallows (Hirundinidae). The Fork-tailed Drongo* (Dicrurus adsimilis) *sometimes catches small fish by swooping from a perch, hovering low over the water and dipping its bill beneath the surface.*

[*Dicrurus bracteatus carbonarius*, near Brown River, SE New Guinea. Photo: Brian J. Coates]

flowers attract large numbers of insect pollinators, on which drongos can feed. The role of dicrurids as cross-pollinators has been mentioned for the Hair-crested, White-bellied and Black Drongos, and this probably applies to all the other nectarivorous species, at least.

Usually, drongos hunt from an elevated position, generally a horizontal tree branch over a clearing or at a forest edge, or a creeper hanging in the open, as typified by the Shining Drongo, for example. They scan the surroundings also from fence posts, wires, earthbanks and any type of vantage point, as is the case with the Black Drongo and, to a lesser extent, the Fork-tailed Drongo. When stalking prey, drongos often loop back and return to the same perch, and they will always perch after a catch, carrying the prey item in the bill or, in the case of large items, in the claws. Small food items are generally swallowed immediately. When dealing with bees or wasps, some drongos, such as the Spangled Drongo, first wipe the item against a branch to remove the sting, or, after returning to a perch, peck off the sting while holding the prey in their claws. Large items, such as locusts or cicadas, are held down with one foot and progressively torn into pieces with the bill, the victim's wings generally being removed before the prey is swallowed. A Black Drongo, observed eating a large locust, first made a small jump, while still holding its prey, in order to detach one leg, which it tore up and swallowed; it then repeated the operation with the other legs, and finally removed the head and, after some mastication, swallowed what remained of the body. Spangled Drongos, when dealing with food held in the feet, generally toss it into the air before swallowing it. When the drongo has captured a small bird for food, it brings this in the bill or claws to a branch, holds it down with one foot, and pecks at the prey until it is dead; it then tears it into small pieces and swallows them, apparently feathers and all, starting at the neck and continuing until only the legs remain. The entire process may take about 13 to 50 minutes.

Particular and opportunistic foraging techniques include fire-driven hunting by several species, the Fork-tailed, Black, Ashy and Spangled Drongos, which congregate at bush and grass fires and capture insects flushed by the flames, heat and smoke. In the Chitwan National Park, in Nepal, a concentration of about 50 Black Drongos and four Ashy Drongos was in attendance together with more than 30 Ashy Woodswallows (*Artamus fuscus*) and three Common Black-shouldered Kites during permitted burning and harvesting of *Saccharum* cane. Fork-tailed Drongos in Africa and, to a lesser extent, Bronzed Drongos in Asia are often seen perched on roadside fences, electricity poles or wires, from where they can take advantage of insects disturbed by passing cars or those landing on the clear road surface, where they can be immediately spotted and captured. The habit of hunting at dusk or at night around artificial lights has been reported for at least five dicrurids. In Africa, the Fork-tailed Drongo is known to hunt occasionally up to 90 minutes after sunset and 40 minutes before sunrise, hawking moths and other nocturnal insects, and the Velvet-mantled Drongo, too, sometimes seeks prey at dusk or dawn. The Aldabra Drongo hunts regularly at dusk, including from trees above beaches, where insects falling on the sand can be easily detected. In India, the Black Drongo is known to feed at night around streetlamps for up to 2–4 hours after sunset. This unusual behaviour of crepuscular or nocturnal hunting has been observed too for the White-bellied Drongo, a forest bird that avoids human habitations; in this instance, it may result from the gradual reduction of food resources in the periphery of expanding cities following woodland destruction and the huge numbers of insects attracted by city lights.

An interesting example of co-operative hunting has been reported for two Black Drongos around a bee hive suspended beneath the roof of a building. One individual made a quick pass and hit the hive, while the second followed behind and captured some of the disturbed bees as they came out.

Being territorial birds, drongos generally forage alone, in pairs or in small family parties of three to five individuals. Although several species, including the Fork-tailed Drongo, are known to gather occasionally at fires and other sites of food concentration, such as the mass emergences of flying ants and termites, the Andaman Drongo is the only member of the family that is truly gregarious, as it can frequently be found in single-species groups of 10–20 individuals foraging through the forest. At least 18 drongo species are known to associate, when foraging, with a variety of other animals, ranging from ants to Aldabra giant



Monogamous and in most cases highly territorial, drongos live in pairs in which the bond is very strong. More than half the drongo species, including the ***Bronzed Drongo****, are known to perform duets, which are performed at different points of the territory, helping to delimit its boundaries while at the same time maintaining a close bond between the partners. Territory size has been calculated for a relatively small number of species to date, the averages ranging from about 0·6 ha to about 3 ha.*

[*Dicrurus aeneus aeneus*, Jiouliao, Yilan, China. Photo: Yung-Fu Chen]

tortoises (*Dypsochelis dussumieri*), to other birds, and to mammals, including livestock. The most frequent associations, however, are mixed-species bird parties, and these are exploited by 15 dicrurids: the Pygmy, Spangled, Sumatran, Wallacean, Greater Racquet-tailed, Sri Lanka Crested, Lesser Racquet-tailed, Crow-billed, Bronzed, Black, Madagascar Crested, Fork-tailed, Velvet-mantled, Square-tailed and Shining Drongos. By being members of such feeding parties, which contain anything from a few individuals to dozens of birds, drongos benefit from a "beater effect" and capture prey flushed by other participants. In return, the drongos act as "sentinels" and contribute to the success of mixed flocks by giving alarm calls informing all participants of the presence of a predator. Several studies conducted in Asia, Africa and Madagascar have shown that the feeding success of drongos, in these cases the Greater Racquet-tailed, Fork-tailed, Black and Madagascar Crested Drongos, increased when they were following other species in mixed flocks compared with when foraging alone. In New Guinea, a study found that 64% of mixed flocks contained at least one individual of either the Pygmy Drongo or the Spangled Drongo, but never both species in the same flock. In Sri Lanka, Greater Racquet-tailed Drongos are frequently associated with the highly gregarious Orange-billed Babbler (*Turdoides rufescens*) in mixed feeding parties. Both are considered "nuclear" species, having a key role in the formation and coherence of mixed feeding flocks, which contain an average of about ten species and 40 individuals. Their combined presence is highly attractive to other gregarious insectivorous birds, the drongo serving as a more sensitive and reliable alarm-caller. The Greater Racquet-tailed Drongo associates also with the Ashy-headed Laughingthrush (*Garrulax cinereifrons*) and the Jungle Babbler (*Turdoides striata*), adjusting its perching height to those species' hunting habits, and using vocal mimicry of their songs and contact calls in order to increase its proximity to them, normally to within 5–10 m. Black Drongos in Tamil Nadu, in southern India, have a mutually beneficial association with the Yellow-billed Babbler (*Turdoides affinis*), the former capturing insects flushed by the latter and giving the alarm against predators. A study conducted nearby, in Bangalore, indicates clear gains for the Black Drongo when associated with Common Mynas (*Acridotheres tristis*) and Jungle Mynas (*Acridotheres fuscus*) in terms of increased frequency of foraging and greater probability of capturing insects in each foraging trip; the association has neither benefits nor costs for the mynas. In Madagascar, the endemic drongo associates in mixed flocks with such species as the Common Newtonia (*Newtonia brunneicauda*), the Common Tetraka (*Bernieria madagascariensis*) or the Rufous Vanga (*Schetba rufa*).

Certain drongos associate with individual bird species in a commensal relationship which benefits generally only the drongo and may occasionally involve some form of parasitism. Observations in Peninsular Malaysia suggest that the Greater Racquet-tailed Drongo associates with woodpeckers during the majority of its foraging time. The Aldabra Drongo often accompanies on that island the Madagascar Coucal (*Centropus toulou*), capturing insects displaced by this larger bird and which the coucal itself is unable to catch, a relationship that may involve some form of parasitism. During a study in Botswana, the Fork-tailed Drongo was recorded as foraging in association with 37 different wildlife species, which it used as prey-flushers. These included 21 terrestrially foraging bird species, 15 of which were insectivores/omnivores, mainly the Red-billed Buffalo-weaver (*Bubalornis niger*) and Cape Glossy Starling (*Lamprotornis nitens*), along with other *Lamprotornis* starlings, *Tockus* hornbills and the Hoopoe (*Upupa epops*), and six gregarious granivores, mainly the Southern Masked-weaver (*Ploceus velatus*) and Southern Grey-headed Sparrow (*Passer diffusus*), together with the Scaly-fronted Weaver (*Sporopipes squamifrons*) and queleas (*Quelea*). In addition, the drongo exploited eight gleaning, pouncing or hawking insectivore species, such as rollers (*Coracias*), helmet-shrikes and bee-eaters (*Merops*), and four large terrestrial birds, mainly the Ostrich (*Struthio camelus*) and the Helmeted Guineafowl (*Numida meleagris*).

Several dicrurid species will accompany wild mammals such as monkeys or squirrels (Sciuridae) in order to capture insects disturbed by the mammals. This has been recorded for the Black, Fork-tailed, Hair-crested, Sumatran, Greater Racquet-tailed, Ashy and Andaman Drongos, and it is possible that other drongo species behave in a similar manner. In Africa, the Fork-tailed Drongo



Although it occurs in somewhat varied environments, from at least 2000 m in the Himalayas south to Sri Lanka, the ***White-bellied Drongo*** *has a fairly well-delimited breeding season, with little variation between north and south. Birds begin displaying around February or March, depending on the locality, with the bulk of the breeding activity taking place from March to June. This coincides fairly well with the period just before the onset of the south-west monsoon, which does so much to shape the Subcontinent's climate. At the start of the breeding season, the drongos will search for a suitable nest-site, normally 3–9 m above ground level, in a small or medium-sized tree.*

[*Dicrurus caerulescens caerulescens*, Goa, India. Photo: Jussi Vakkala]

is known to forage in close association with livestock, including cattle, goats, sheep, donkeys and also domestic dogs and chickens, these being involved in 61% of all associations observed in Botswana, and with large wildlife game, mainly African elephants (*Loxodonta africana*) but also such others as giraffes (*Giraffa camelopardalis*), greater kudus (*Tragelaphus strepsiceros*), African buffaloes (*Syncerus caffer*) and chacma baboons (*Papio ursinus*), which accounted for 7% of all observed associations in Botswana. Similarly, in Asia, the Black Drongo is often found with livestock, including cattle, water buffaloes (*Bubalus arnee*) and goats, when foraging, and the same association has been reported in Pakistan for the Ashy Drongo. Perching on nearby trees and bushes, these birds follow individual animals or herds and capture insects displaced by the mammals, or in some cases attracted to or living on them; these two drongo species will occasionally perch on the animals as they move, and in Sri Lanka the Black Drongo has been observed to eat ticks (Ixodoidea) directly from the back of mammals. Such consumption of external parasites or potential disease-vectors illustrates a limited but interesting form of symbiosis between, on the one hand, certain drongos and, on the other, cattle or wild herbivores.

On Aldabra, a remarkable association was discovered between the Aldabra Drongo and the giant tortoise: the former perched close to herds of tortoises resting under the shade during the hot hours of the day, and regularly swooped down to snap up various flies or other insects attracted by the tortoises and their dung, or followed these large animals as they moved around and displaced insects. The drongo's mandibles produced a characteristic "clap" sound as the bird seized an insect. Another interesting association concerns the Shining Drongo, a bird of the African equatorial rainforests, which follows swarms of the carnivorous driver ant *Dorylus wilverthi* for hours, sallying rapidly for disturbed insects in trees or plunging after falling prey, competing with and sometimes aggressive towards other large ant-followers such as bulbuls, hornbills and small raptors. Similarly, Fork-tailed Drongos have been reported following ants in Tanzania.

Kleptoparasitism on a variety of other bird species is practised by at least eight members of the Dicruridae. These are the Greater Racquet-tailed, Spangled, Pygmy, White-bellied, Black, Ashy, Fork-tailed and Madagascar Crested Drongos. The Black Drongo has been seen stealing food from Hoopoes, Common Mynas and wagtails (*Motacilla*). The Fork-tailed Drongo occasionally robs birds bringing insects back to their own nests, for example Cardinal Woodpeckers (*Dendropicos fuscescens*); other victims are the Cape Longclaw (*Macronyx capensis*), various pipits (*Anthus*), wagtails, and Hoopoes, which appear particularly vulnerable to such piratical attacks. When in mixed-species feeding parties, Fork-tailed Drongos may also steal food from other party-members such as the Kurrichane Thrush (*Turdus libonyanus*) or the Southern Pied Babbler (*Turdoides bicolor*), which have a complex association with the drongos; this may happen only in a very small minority of cases, less than 1%, for instance during difficult climatic conditions when the abundance of flying insects is low, as shown in studies in Botswana. When foraging in these parties, drongos act as sentinels, warning of the proximity of predators, but they occasionally give false alarm calls in order to distract other members and steal their food, typically mimicking the specific predator-calls of the other species to make them drop their food. This has also been reported for a Spangled Drongo which was chasing a food-carrying Magpie-lark (*Grallina cyanoleuca*) that was not in a feeding party, after an initial, unsuccessful attempt using its own drongo alarm cry. When their group contains enough members to keep watch efficiently themselves, Southern Pied Babblers respond by chasing the drongos away aggressively, whereas small babbler groups prefer to tolerate the presence of drongos and pay the price of occasional piracy. Cases of piracy by the Greater Racquet-tailed Drongo when in mixed feeding parties have been reported, the victims being the Orange-billed Babbler, Ashy-headed Laughing-thrush, Malabar Trogon (*Harpactes fasciatus*) and Indian Scimitar-babbler (*Pomatorhinus horsfieldii*). A study in Sri Lanka, however, found that such kleptoparasitism represented a minority of cases, just 3% of drongo feeding attempts, compared with captures of insects displaced by other birds, which accounted for 41%. In conclusion, drongos are better classified as commensalists or mutualists, rather than as parasites, since they exact only a small cost on other species in flocks.

Breeding

While the breeding biology of a few dicrurids, mainly the Fork-tailed, Aldabra, Mayotte and Black Drongos, is very well known, relatively limited information is available for many others, despite the fact that most of the species are very common birds.

Generally, drongos have an established breeding season, the period and length of which vary geographically across the different tropical biomes, and which usually coincides with the wettest season, or the period when large insects, on which the chicks are raised, are most likely to be abundant. A few species, however, appear able to breed in all months of the year in the rainforests or secondary evergreen forests of equatorial Africa and Asia; the Shining Drongo and the Velvet-mantled Drongo exhibit no clearly defined nesting season in part of their African equatorial range, and this applies also to the Balicassiao in the Philippines and the Spangled Drongo in New Guinea. The Fork-tailed Drongo, which occupies seasonal savanna ecosystems on both sides of the equator, has breeding seasons in line with the differences between the two hemispheres in the timing of the rainy seasons, roughly March–September in the north and September–January in the south, the same applying to the Square-tailed Drongo. All four drongos of the Indian Ocean islands have a clearly defined breeding season, between October and February, coinciding with the rainy season. In Asia and Australasia, some species appear to have short nesting seasons lasting for just a few months, an example being the Wallacean Drongo, which nests in October–December in the Lesser Sunda Islands. In contrast, some others have been recorded as breeding for up to eight or nine months of the year; examples are the Spangled Drongo, nesting from September to early May in Australia and in July–March in New Guinea, and the Black Drongo, breeding from April to December in Java and Bali. Generally speaking, species with a limited geographical distribution tend to have a shorter nesting season, in contrast with those that are widely distributed, especially from north to south. In tropical monsoon climates, drongos will normally start to lay their eggs soon after the first rains, although nests are sometimes built several weeks earlier in the season, as observed for the Aldabra Drongo. In a study conducted on 65 nests of Black Drongos in Calicut, in south-west India, the egg-



In the eleven drongo species for which information is available, both sexes take part in nest building. In the ***Ashy Drongo****, the female does most of the construction work, while the male brings materials, although in the early stages, he may occasionally help with placing them. The work takes five to ten days. A longer period of up to 20 days is sometimes required in some species. Some species build the nest with remarkable delicacy and precision, intertwining each piece of material as if using a needle and thread, and sitting in the cup and hollowing it out with wriggling movements of the breast.*

[*Dicrurus leucophaeus leucogenis*, Nanjing, Jiangsu, China. Photo: Li Hang]



All four drongos of the Indian Ocean islands have a clearly defined breeding season coinciding with the rainy season. Nesting of ***Mayotte Drongo*** *has been observed between September, with the first eggs, and February, with the last fledglings. In a study of Black Drongos* (Dicrurus macrocercus) *in south-west India, egg-laying was synchronized with the incoming monsoon, so that nestling and fledging periods coincided with the highest insect abundance. Fork-tailed Drongos* (D. adsimilis), *which occupy seasonal savanna on both sides of the equator, have breeding seasons in line with the differences in the timing of the rainy seasons. In the equatorial forests of Africa and Asia, however, most species appear able to breed in all months of the year.*

[*Dicrurus waldenii*, Mayotte, Comoro Is. Photo: Pete Morris]

laying period was synchronized with the incoming monsoon, and two-thirds of the eggs were laid within two weeks after the first rainfall, so that the nestling and fledging periods coincided with the time when insect abundance was very high.

Monogamous and in most cases highly territorial, drongos live in pairs in which the bond is very strong. They are extremely aggressive, and will defend a certain area around the nest from other drongos and potential predators. For example, the Black Drongo in India defends the habitat within an average radius around the nest of about 45 m, corresponding to an area of about 0·6 ha. Whenever another drongo penetrates inside what the pair considers to be its territory, the owners will fiercely chase the intruder. A territory size of about 3 ha has been estimated for the Spangled Drongo in New Guinea, and an average size of 2·4 ha has been calculated for the Mayotte Drongo on the basis of nest distribution in a densely occupied forest. Territorial fighting between neighbouring pairs is frequent and has been documented for several species, among them the Black and Mayotte Drongos.

At the approach of the breeding season, drongos will resume their territorial songs and displays, or increase the frequency of them when this season is not so neatly delimited within the year. Of eight species in the African and western Indian Ocean region, six are known to perform territorial displays; these are the Fork-tailed, Shining, Velvet-mantled, Mayotte, Comoro and Aldabra Drongos. These displays include duets between the male and the female, although these are less frequent and less clearly defined for the Aldabra Drongo, and they correspond also to a courtship activity. They are performed mainly at different points of the territory, helping to delimit its boundaries while at the same time maintaining a close bond between the partners.

Displays of the Fork-tailed Drongo include bowing and bobbing of the head while the male sings or during duets, with aerial stunts at dusk when the birds rise vertically for several metres and dive steeply back to the same perch. In the displays of the Velvet-mantled Drongo, the male bows from side to side while the female flutters her wings. Aldabra Drongo partners face each other, each with the bill held slightly above the horizontal, and shaking the wings vigorously and wagging the tail from side to side while uttering high-pitched soft squeaky sounds. Pairs of the Mayotte Drongo have been observed performing spectacular duetting displays; these were more frequent during the early morning and late afternoon, but they were heard also during the rest of the daytime. The two partners perched next to or facing each other, almost touching, while singing loud harsh and grinding notes, the male and female responding to one another in rapid alternation, giving the impression of a repetitive jumble of chirps and squeaks, while vigorously raising and lowering the head and body in a rhythmic and perfectly synchronized way, almost as a kind of dance, at the end of which copulation sometimes took place. The two members of a Mayotte Drongo pair were once observed to play together with a leaf, which one partner, presumably the male, offered to the other (see also General Habits). Similar courtship behaviour has been reported also for the Madagascar Crested Drongo and for the Greater Racquet-tailed Drongo, and it may be practised by other drongo species, too.

Little is known about the courtship and displays of the Asian and Australasian drongos. These have been recorded only for five species, the Black, Greater Racquet-tailed, Lesser Racquet-tailed, Spangled and Tablas Drongos, duets being mentioned for the last two species. The courtship displays and duets in India of the Black Drongo, a species closely related to the Fork-tailed Drongo of Africa, were described as follows: "two birds, frequently a trio, will sit together face to face and will talk loudly at one another (argue?), in harsh scolding notes, raising heads, and foreparts of body, and up and down like hammering with the bill and fluttering the wings from time to time". The two sexes chase each other in flight, bringing their bills into contact and interlocking their wings, which can cause them to fall to the ground; during copulation, the female lowers the fore part of her body slightly and raises her tail, while the male mounts her, tilts his tail, and brings his cloaca into contact with hers. Displays and duets by Spangled Drongos have been observed in Australia. The two partners first sit side by side, facing away from each other and calling, flicking the tail and shaking their partly extended wings; they



*The nest of the **Fork-tailed Drongo** is generally built 5–7 m above the ground, and usually slung across the fork of a horizontal branch, to which it is firmly fastened by cobwebs or leaf petioles. Occasionally the Fork-tailed will build a larger bowl on top of a fork or horizontal branch. Drongo nests are relatively small, with a shallow rounded cup, sometimes giving the impression that the bird barely fits inside. Materials can include rootlets, fine creepers and grass stems, coconut fibres and casuarina needles, all bound together with cobweb, and with a rim of leaf petioles, cobweb or lichens. Most nests are relatively coarsely built, with a thin floor, so that the contents can often be seen from below.*

[*Dicrurus adsimilis*, Modimolle, Limpopo, South Africa. Photo: Warwick Tarboton]

then turn and face each other, calling in unison, one bobbing and bowing. During the magnificent flight displays by this species, a singing individual flies upwards, with its wings raised at 45 degrees above the body, the latter almost vertical; as its momentum decreases, it drops forward rapidly, its tail held arched over the body and its head pointing downwards, until, when about 3 m above the ground, it stops calling, spreads its wings and flies off. A pre-copulatory display by the Spangled Drongo has also been described. In this, which was performed around the nest, the male, having wiped his bill on each side of a branch, pecked repeatedly at the female's feet and at her body, leaping over her several times from side to side, while she held her feathers puffed up and was rapidly quivering her wings; the wingbeats of both birds were very audible during the ensuing copulation.

Drongos normally build their nests in trees, and in a great variety of locations, depending on the type of habitat which they occupy. Nests can be found in deep forest, in forest clearings and openings, at forest edges, above streams or rivers, including in gallery forest, or in isolated trees. They are normally located close to open places, often overhanging an area of several metres without vegetation, those of the Mayotte Drongo, for example, being on average 7·4 m above vegetation. Most often, the nest is built at the extremity of a horizontal branch, although it is sometimes sited at the base of leaf stalks in a palm, as with the Hair-crested, Ashy and Sri Lanka Crested Drongos, among upright twigs from a node in a bamboo, as with the Bronzed and Black Drongos, or next to a tree trunk, a site often chosen by Black, Sri Lanka Crested, Fork-tailed and Madagascar Crested Drongos. Nests of Andaman and Ashy Drongos have been reported in conspicuously open sites, such as in dead or leafless trees. The height above ground at which drongo nests are built varies from 2 m, when nests are located in lower branches, to over 30 m for species present in deep primary forests, as in the Square-tailed and Shining Drongos, although recorded nests of most dicrurids have generally been between 4 m and 15 m. In Bali and Java, exceptionally low nests, described as "close to ground", have been reported for the Black Drongo. A study of 47 nests of Hair-crested Drongos, conducted in China, recorded heights of 2–14 m, distances of nest to main branch of 1–8 m, and branch lengths of 1·5–9 m; it identified the distance to the mountain ridge and to water, the average height of the tree, and the shrub density as the main factors related to nest-site selection.

Generally speaking, the choice of tree species in the selection of the nest-site location does not seem very important, as most drongo species build their nests in a very wide variety of trees, including mango and rubber (*Hevea*), mangrove trees, bamboos, oaks (*Quercus*), pines (*Pinus*), acacias (*Acacia*), *Albizzia*, tamarinds (*Tamarindus*), eucalypts (*Eucalyptus*), figs (*Ficus*), casuarinas and others, many of them being introduced or invasive species. In the Indian Ocean, 26 nests of Mayotte Drongos, located 5–18 m above the ground, were in 16 different trees species, of which four, the mango, the mbarabai (*Grisollea myrianthea*), the African tuliptree (*Spathodea campanulata*) and the sang dragon (*Pterocarpus indicus*), all except one introduced, represented half of the sites; for the Aldabra Drongo, a total of 24 nests was found at between 2 m and 13 m, built preferentially in taller casuarina species or mangrove trees, but also on smaller terrestrial native trees such as figs or *Euphorbia*. The Black Drongo, which lives mainly in open artificial habitats, appears to be the least rigorous member of the family in terms of its nest-site selection, using a large variety of tree species and nesting sites, including atypical nests on electricity poles in India. In a study of this drongo conducted on a university campus at Calicut, in southern India, 65 nests were found at heights of between 2 m and 13 m, and the species showed a strong preference for jackfruit (*Artocarpus integrifolia*), 48 of the 60 available trees holding nests. This was possibly due to the jackfruit's more open type of leaf arrangement, offering a better view of the territory compared with cashew (*Anacardium occidentale*), of which only eight of the hundred trees were utilized, mango, fig, *Macaranga* or *Alstonia*.

Both sexes seem to participate in the constructing of the nest, as reported for all of the eleven species for which information on nest-building is available. In the case of the Ashy Drongo, the female apparently does most of the building work while the male brings the material. The work of construction may take between four and ten days for the Spangled, Ashy, Black and Mayotte Drongos, but a longer period is sometimes required, up to 20 days for the Aldabra Drongo. Drongo nests are generally located in a small fork of a horizontal branch, firmly bound to the twigs of the fork by a rim of leaf petioles or other fibres, and are rela-



*Even for one of the smallest drongos, the nest of the **Square-tailed Drongo** is relatively very small indeed, with an inner cup just 5 cm wide and 2·5 cm deep. Incubation of the clutch of two or three eggs is shared by the parents, and they will also rear the brood together. This species has the largest average clutch size, of 2·7 eggs. There is no information on its incubation and nestling periods. Indeed, details of incubation are documented for only seven of the 26 species, ranging from 13 days to 19–20 days. During nesting, the forest floor below the Square-tailed Drongo's nest becomes covered with accumulated white droppings.*

[*Dicrurus ludwigii*, Seldomseen Ringing Station, Bvumba, Zimbabwe. Photo: Peter J. Ginn]

tively coarsely built, with a thin floor, and sometimes thin walls, so that the contents can often be seen from below. Those of Asian and Australasian drongos normally appear suspended from the fork in the manner of a cradle or hammock, whereas nests of African and Indian Ocean drongos, namely the Mayotte, Aldabra, Madagascar Crested, Comoro and Fork-tailed Drongos, can sometimes look as if they are placed on top of the fork, like that of the related Black Drongo in Asia.

Dicrurid nests are relatively small and with a shallow rounded cup, sometimes giving the impression that the drongo barely fits inside, for instance the nests built by Bronzed and Square-tailed Drongos. The diameter of the nest is roughly twice as great as the depth. For the majority of Asian drongos, the dimensions vary from 9 cm to 15 cm in external diameter, 6 cm to 10 cm in internal diameter, 4 cm to 7·5 cm in external depth and 2 cm to 5 cm in internal depth. A notable exception is that of the Hair-crested Drongo, which builds much larger nests: externally, the nest diameter is about 22 cm and the depth 11 cm, the corresponding internal measurements being 10 cm and 4 cm. Nests of drongos of Africa and the Indian Ocean have a thicker wall but a similar egg-chamber, with external diameter in the range 11·5–17 cm and depth in the range 5–8 cm, and internally 7·5–9 cm in diameter and 2·5–4 cm in depth; the Square-tailed Drongo represents an exception, its nest, the smallest of all drongo nests, measuring 7·5 cm across externally and having an internal diameter of 5·5 cm and an internal depth of just 2·5 cm. Building materials utilized are rootlets, fine creepers and grass stems, including khus-khus grass (*Vetiveria zizanioides*) in the Indian Subcontinent, and coconut fibres and, on Aldabra, casuarina needles, all bound together with cobweb, and with a rim of leaf petioles, cobweb or lichens; the lining consists of grasses, coarse fibres, horsehair, lichens, pieces of bark and, more rarely, leaves or sheep wool. The structure is woven to the tree fork by its margins. Some species, such as the Bronzed Drongo, build the nest with a remarkable delicacy and precision, intertwining each piece of material as if using a needle and thread, and sitting in the cup and hollowing it out with wriggling movements of the breast. Occasionally, an old nest is destroyed and its materials reused to build a new one, as has been reported for the Square-tailed Drongo and others.

Drongos lay from one to five eggs per clutch, normally at the rate of one per day. In the African and Indian Ocean region, the clutch size is between one and four eggs, although average clutches measured for individual species normally comprise 2–3 eggs. The Fork-tailed Drongo and the Square-tailed Drongo have the largest average clutch sizes, with, respectively, 2·7 and 2·6 eggs; the Comoro Drongo, with an average clutch size of 1·3 eggs, and the Shining Drongo, with an average of 2·0, apparently lay the fewest eggs. In Asia and Australasia, the clutch varies between two and five eggs, but is more frequently of three or four: the average clutch size of the Spangled Drongo in Australia is 3·4 eggs and that of the Black Drongo in south-west India is 3·0 eggs, whereas the Hair-crested Drongo sometimes lays up to five eggs; the Andaman, Ashy and White-bellied Drongos, on the other hand, normally lay only two or three eggs. Egg weights are documented with only a few examples, such as 4·8–5·8 g for the Black Drongo and an average of 2·3 g for the Square-tailed Drongo.

Dicrurid eggs can be broad to elongated oval or pyriform in shape, with substantial variation within one and the same species. Their measurements are 20–30 × 15–21 mm, depending on the species; the Square-tailed Drongo and two races of the Bronzed Drongo have the smallest eggs, 21–22 × 16 mm, the largest being the eggs of the Greater Racquet-tailed Drongo, measuring 28–30 × 20–22 mm, and those of the Hair-crested Drongo, 29 × 21 mm. Drongo eggs vary also in colour, from pinkish-white or creamy, rarely pure white, to deep salmon-pink, more or less spotted or blotched, mainly at the larger end, with rufous or brownish-red on underlying purplish lavender-grey and sometimes with tiny dark brown specks, depending on species and race; individual variability also is very high. Particularities include longitudinal streaks, typical of the eggs of the Crow-billed Drongo, and glossiness, reported for eggs of the Andaman and Spangled Drongos. Eggs from the same clutch are always similar to one another, with very few exceptions in size and colour reported.

Incubation periods are poorly known for this family. Details are documented for only seven of the 26 species. The period ranges from 13 days, for the Bronzed and Ashy Drongos, to 19–20 days, as recorded for the Spangled and Mayotte Drongos. The remaining three species for which data are available are the Black, Aldabra and Fork-tailed Drongos.

The chicks remain in the nest for 15–22 days, but the duration of this stage of the breeding cycle is much more variable than that of incubation and has been measured for only five species. These are, in order of increasing length of nestling period, the Fork-tailed, Black, Aldabra, Mayotte and Spangled Drongos. The parents will feed hatchlings with small and soft insects, described as a process of "regurgitation" for Black Drongos in Myanmar, for the first 2–3 days, during which one parent will remain to brood the young, as observed with several species. The adults also remove faecal sacs and, as the chicks grow, feed them with progressively larger prey items, transferring the whole food directly into the nestling's mouth; when presenting very large prey, such as locusts, the parents first remove the wings and sometimes the head, and carry out some initial mastication of the food. Hatchlings of the Black Drongo have a yellowish-red mouth-lining, a flesh-coloured bill, and dark greyish tarsi that will gradually turn black. Young drongos develop very rapidly, and their weights increase steadily, the remiges and rectrices protruding at about seven days of age. For the first few days after leaving the nest, the fledglings are weak fliers and are, therefore, very vulnerable to predation during this period. For the first two to three weeks, they are still easily recognizable by the short tail and the relictual gape-flanges, the latter being white or yellowish in some species. Fledglings normally never return to the nest after they have left it, although young Spangled Drongos perhaps do so occasionally. They remain dependent on their parents and are fed for at least 4–7 weeks, as observed for the Black, Spangled, Aldabra and Mayotte Drongos.

Parental care, including the incubation of the eggs and the feeding of the chicks, is undertaken by both parents, at least in the nine species for which such information is available, but how this task is shared between the sexes remains to be elucidated.



*Nests of the **Lesser Racquet-tailed Drongo** seem mainly to be built close to open places, where ample light and sunshine encourage an abundance of flying insects. Both parents incubate the eggs and tend the brood. Drongo chicks remain in the nest for 15–22 days. The parents feed their chicks with small and soft insects for the first two to three days, during which one adult always remains to brood the young. The adults also remove faecal sacs. As the chicks grow, the adults feed them with progressively larger prey. They will remove the wings and sometimes the heads of very large prey items, such as locusts, and carry out some initial mastication.*

[*Dicrurus remifer peracensis*, Fraser's Hill, Malaysia. Photo: Ong Kiem Sian]

The female of the Hair-crested Drongo, for example, has been reported as doing most of the incubation. Interestingly, observations have been made of one of the two nesting adults, presumably the male, feeding its incubating partner with an insect; this has been recorded for the Mayotte, Fork-tailed and Madagascar Crested Drongos.

Although no drongo species is known to indulge in co-operative breeding, two instances of pairs with helpers have been described, both involving the Black Drongo in India. In one case four adult drongos, presumably two parents and two helpers, the latter probably young from an earlier brood, simultaneously fed three drongos fledglings. In another, rather remarkable case, an adult Red-vented Bulbul (*Pycnonotus cafer*) was reportedly feeding two young drongos, both at the nest and after they had fledged; the bulbul was finally accepted by the drongo parents, which had initially chased it.

Despite the legendary aggressiveness of drongos and their highly evolved defence behaviour, some of these species appear to suffer surprisingly high rates of nest predation. Little information is available on the breeding success of drongos, but recent investigations have shed some light on this aspects for two Indian Ocean species. Artificial nest experiments and observations revealed that, in certain years, more than 70% of the nests of the Aldabra Drongo were preyed on at the egg stage by rats (*Rattus*), Pied Crows (*Corvus albus*) and probably other large birds, such as coucals, herons (Ardeidae) and bulbuls. The overall rate of nest failure calculated over two years for the Mayotte Drongo was 75%, the principal cause being predation at both the egg and the nestling stages; the other factors affecting nesting success were falling branches as a result of adverse weather, and human disturbance. Despite the fact that pairs can make new nests and lay replacement clutches, in some years on Aldabra only 20% of them succeed in producing fledglings, with annual productivity of 0·4–0·6 fledglings per breeding pair, a hatching success for 31 eggs of 29%, and a fledging success for ten nestlings of 80%. On Mayotte, based on 20 nests, about 70% of pairs were successful in producing an average of 1·4 fledglings per year, with a hatching success of 53% and a fledging success of 46%.

Yearly productivity rates are not available for Asian drongos, and the few existing data cannot always be compared between species. For Spangled Drongos, 70% of 29 nests monitored in Australia in the 1990s succeeded in producing fledglings, and 45% of eggs laid produced hatchlings. During a study of 57 Black Drongo clutches in India, the hatching success was 63% and the fledging success 71%. The number of fledglings produced per nest in which eggs were laid was 1·3 for both the Spangled Drongo and the Black Drongo, which compares with values of 1·3 for the Mayotte Drongo and 0·4 for the Aldabra Drongo, although the sample sizes for the Spangled and Mayotte Drongos were very small. Breeding success in terms of number of fledglings produced per egg laid varies from 23% and 25% respectively for the Aldabra and Mayotte Drongos to 39% for the Spangled Drongo, and 44% for the Black Drongo.

After experiencing failure at the laying stage or during incubation, drongos will generally build a new nest and lay a replacement clutch, which tends to be smaller than the first one. They do not normally reuse the nest for a replacement or second brood, but this has been documented once for the Aldabra Drongo. In the event of a second failure, certain species will lay yet again, and one pair of Aldabra Drongos is known to have built a new nest and re-laid up to four successive times during the same season. Some dicrurids, however, will not renest if failure intervenes at an advanced stage of incubation, as has been shown with the Black Drongo in south-west India. There are no reports of replacement clutches having been laid after failures at the chick stage. Drongos normally raise only one successful brood per year, with the exceptions of the Fork-tailed Drongo, which can raise two and even three successful broods per year in southern Africa, and the Black Drongo, which rears a second brood in north India but not in the south of that country, where the length of its breeding cycle does not allow a second brood.

Because of their very aggressive nature, drongos will regularly chase from their territory any animal likely to represent a danger. They fiercely defend a certain area around the nest from intrusion not only by neighbouring conspecifics, but also by any large birds that may represent a danger. They readily attack, among others, crows, various raptors such as sparrowhawks and goshawks (*Accipiter*) and eagles of the genera *Spizaetus*, *Eutriorchis* and *Haliaeetus*, as well as monkeys, cattle, dogs, and even humans who approach too close to the nest. Despite the comparatively small size of many drongos, no animal seems to be large enough to intimidate them when it comes to defending the nest.

Nevertheless, some bird species are accepted within the territory, but not in the nesting tree, one example being the acceptance by the Black Drongo in India of Rufous Treepies (*Dendrocitta vagabunda*) and orioles. Others are tolerated in the same nesting tree or in the immediate vicinity of the nest, about 5 m from it. These latter species, normally of similar size to or somewhat smaller than the drongos themselves, form a nesting association with them, building their nests close to those of drongos in order to benefit indirectly from the increased protection against predators they provide. Examples of this association include the Groundscraper Thrush (*Psophocichla litsitsirupa*) nesting with the Fork-tailed Drongo in southern Africa; the Red-vented Bulbul and Yellow-billed Babbler with the Black Drongo in India; and the Australasian Figbird (*Sphecotheres vieilloti*), Helmeted Friarbird (*Philemon buceroides*), Leaden Flycatcher (*Myiagra rubecula*) and Shining Starling (*Aplonis metallica*) with the Spangled Drongo in Australia.

Less favourable associations include that between dicrurids and brood-parasitic cuckoos. Indian Cuckoos (*Cuculus micropterus*) parasitize Ashy Drongo nests, Asian Drongo-cuckoos (*Surniculus lugubris*) and Common Koels (*Eudynamys scolopacea*) lay in nests of Black Drongos, the Australian race *cyanocephala* of the Common Koel and Pallid Cuckoos (*Cuculus pallidus*) parasitize Spangled Drongo nests, and the African Cuckoo (*Cuculus gularis*) has the Fork-tailed Drongo as its exclusive host.

After reaching independence, the young generally remain in the parents' territory until at least the start of the next breeding season, when they will be chased away by their parents, but they may still be tolerated at the periphery of the territory for a further year or so. The juveniles sometimes join the parents in chasing off predators and participate in the defence of the territory, but, as observed for the Aldabra Drongo, they will normally not assist them with the raising of the next brood. Juvenile drongos seem to pair up and become part of the breeding population when they are about two years old. This has been found to be the case during studies in India of Black Drongos ringed as chicks, one of which started to breed when 22 months old, and also with Aldabra Drongos, the young of which do not normally breed until at least two years of age. The breeding partners are likely to remain paired for at least several years, or even for life, and established pairs normally remain in the same territory from one year to the next. In the case of Spangled, Mayotte and Aldabra Drongos, the same pairs have been confirmed nesting in the same tree or in its vicinity for at least 2–3 years. Spangled Drongos have been known to use the same nesting sites for as many as eight consecutive years, although it is not known if the same pair was involved every year.

Very little is known about the life expectancy of drongos. Ringed Fork-tailed Drongos have been retrapped after six years in southern Africa, and undocumented reports mention estimated longevities of 15 years in Africa. In Australia, one ringed adult Spangled Drongo was retrapped nearly eight years later at the same place, and one colour-ringed adult Aldabra Drongo was seen again in the same area similarly after eight years. In Thailand, Lesser Racquet-tailed and Greater Racquet-tailed Drongos have been recovered after six and three years, respectively. Few records are available on the levels of predation on adult drongos, perhaps as a result of the excellent defensive behaviour of these species. Nevertheless, most efficient predators, such as falcons (*Falco*), do sometimes manage to take dicrurids. In Namibia, for example, a Red-necked Falcon (*Falco chicquera*) succeeded in capturing one adult Fork-tailed Drongo in mid-air.

Movements

Most drongos are mainly or entirely resident, as the majority of them live in tropical and subtropical wooded ecosystems with abundant insect resources available throughout the year. This is true of all African and Indian Ocean species, with only short-distance movements suspected for the Fork-tailed Drongo in southern Africa. Several Asian species, however, undertake true migratory movements, those living in east and central China, and some of the populations occurring along the Himalayan chain, migrating to South-east Asia or peninsular India; and some Australian drongos migrate north to New Guinea. These movements concern populations breeding in areas with the most temperate bioclimates, normally at the highest latitudes or altitudes, where abundance of insects or nectar decreases considerably in the winter months as a consequence of the lower temperatures. These populations therefore migrate to warmer subtropical or tropical areas offering more abundant and predictable food resources.

In China, the Ashy Drongo is more or less subject to long-distance movements, depending on the subspecies. In the northern part of its range the race *leucogenis* is a summer visitor, making a post-breeding migration along the east coast to non-



*The nestling period in **Black Drongos** is usually 16–17 days. For the first few days after leaving the nest, the fledglings are weak fliers and are vulnerable to predation. For two to three weeks, they remain recognizable by the short tail and the gape-flanges. Drongo fledglings remain dependent on the adults for four to seven weeks, and generally remain in their parents' territory until at least the start of the next breeding season. No drongo species is known to breed co-operatively, but in one instance, three fledgling Black Drongos were fed by the parents and also two helpers, probably the young from an earlier brood.*

[*Dicrurus macrocercus*, Panna National Park, Madhya Pradesh, India. Photo: Joanna Van Gruisen/Ardea]

breeding grounds in south China and from north Laos and Cambodia south to the Malay Peninsula; the more southerly race *salangensis* winters in south China, Hainan and Indochina, reaching the northern part of the Malay Peninsula. From the south-western parts of China, the subspecies *hopwoodi* migrates to Hainan and Indochina, while *innexus* is resident on Hainan. The subspecies *brevirostris* of the Hair-crested Drongo is widespread in central and eastern China, where it is only a summer visitor; it spends the non-breeding season in Hainan, Indochina, Thailand, south Myanmar and Tenasserim, generally at higher altitudes than those occupied by the resident nominate race and appearing during migration in more open habitat, such as parks and gardens. Again in China, the subspecies *cathoecus* of the Black Drongo, in its large continental range, is mainly a breeding visitor, spending the winter months in south China and South-east Asia and, rarely, reaching Sumatra, whereas in Taiwan the race *harterti* is resident.

A study conducted in 2003 on a coastal plain adjacent to the Gulf of Thailand gives some indication of the progress of the Black Drongo's autumn migration. The daily peak of passage occurred in the morning at 08:00–10:00 hours, with a further peak in the late afternoon, rarely after 18:00 hours, in contrast to that of the Crow-billed Drongo, which is frequently mist-netted at night. The first passage migrants were recorded at the end of September, and two peaks, with counts of more than 600 birds per hour, were evident, one in mid-October and one in late October, following two periods of heavy rain throughout much of Thailand. The passage was observed below 35 m and mainly below 8 m, often in groups of 5–20 birds across a 30-m front, with no apparent influence of wind direction.

In the Himalayas, the Ashy Drongo is a long-distance migrant, the subspecies *longicaudatus*, which breeds from extreme east Afghanistan eastwards to Bhutan, dispersing in winter to the plains of the Indian peninsula and the east of Sri Lanka. In the foothills, the nominate race of the Hair-crested Drongo is mainly resident from north India east to Assam, but is subject to seasonal movements down to the plains, depending on nectar supplies. For the Black Drongo, the subspecies *albirictus* is a summer visitor in east Afghanistan and north Pakistan, making a post-breeding dispersal to south-west Afghanistan or eastwards to the Indian plains, where it joins part of the population which breeds along the Himalayas and makes only altitudinal movements; birds of this race breeding in north and central Myanmar migrate a short distance to the southern part of that country, where some sedentary populations are present. Also breeding in the north-east Indian subcontinent, as well as in the extreme south of China and the northern part of South-east Asia, the monotypic Crow-billed Drongo is another significantly migratory species, shifting south to winter mainly in Peninsular Malaysia and Indochina; it is rare in Sumatra, an occasional visitor in west Java, and a vagrant in west Borneo and the west Philippines. This drongo, typically a species of dense forest during the breeding season, spends the rest of the year in more open and low habitats, including trees in cultivated areas, and mangroves and coastal shrubs. The other dicrurid species breeding along the Himalayan chain, the Bronzed Drongo and the two racquet-tailed drongos, are subject to only short-distance altitudinal movements, though sometimes reported also as vagrants in non-breeding areas.

Many data have been gathered locally concerning movements of the different populations of the Spangled Drongo in Australia. In general, these birds appear to be resident in the north, but, depending on their local distribution, they can be partly migratory or migratory from south to north, with an overlap of various migratory populations in the east and north of the country, local breeders being replaced by migrants from farther south. In the extreme north-west and north of Australia, the subspecies *baileyi* is resident. In the Cape York Peninsula, in north-east Australia, individuals observed during the October–March breeding season, when only the race *atrabectus* is present, are smaller than many of those seen in the autumn–winter months of April–September, when birds of this partly resident race mix with larger ones of the migratory nominate race. The nominate race, which breeds in central east Queensland southwards from near Townsville, migrates north, reaching mainly south-central New Guinea across the Torres Strait; in east Queensland and New South Wales, however, individuals of this race are recorded throughout the year



Despite the notorious aggressiveness of drongos, some species suffer high rates of nest predation and brood parasitism. The ***Fork-tailed Drongo*** *is the exclusive host of the African Cuckoo* (Cuculus gularis), *Asian Drongo-cuckoos* (Surniculus lugubris) *resemble Black Drongos* (Dicrurus macrocercus) *and lay in their nests. Turning to predation, eggs in more than 70% of Aldabra Drongo* (D. aldabranus) *nests may be preyed upon by rats, Pied Crows* (Corvus albus) *and other large birds, such as coucals* (Centropus), *herons (Ardeidae) and bulbuls (Pycnonotidae). After failure at the egg stage, drongos will generally build a new nest and lay a replacement clutch, but there are no reports of replacement clutches after failures at the chick stage.*

[*Dicrurus adsimilis*, Nylstroom, Limpopo, South Africa. Photo: Clem Haagner/ Ardea]

and are often considered residents, but they may also be the result of migratory populations replacing each other along the east coast. Records of this taxon from south of the breeding range, south of about 31° S, are considered to involve non-breeding visitors and may represent the extent of altitudinal movements. The species regularly descends from the eastern slopes of Great Divide towards the coast, attracted by high yields of nectar and insect food in coastal vegetation during the winter period.

Migration of drongos in Queensland is observed during the daylight hours. It is less concentrated towards the north and occurs over a longer period in the autumn compared with the southward spring passage. Movements are usually in small flocks of four or five individuals, and sometimes up to 30. In north-east Queensland, some migrating flocks are reported yearly along the coast, flying about 500 m offshore and 50–100 m above the water. Spangled Drongos are regularly observed on islands and moving across the Torres Strait, about 100 m above the sea, on their way to New Guinea in March–April or from New Guinea in October–November; in 1978, for example, more than 6000 birds per hour were heading south on a broad front in the early morning of 6th November. The return in south-east Australia of drongos wintering in north Queensland is reported earlier, usually in September–October and sometimes even late August; for example, 400 individuals per hour were counted in north-east Queensland as they migrated SSE on 6th October 1966, and up to 720 birds/hour were counted in late October. Northward departure of migrating drongos occurs mainly between March and May, with possible early records in February in New South Wales. Spangled Drongos spending the non-breeding season in New Guinea occupy the south-eastern part of the island, in the Trans-Fly region, and also the small islands in the north part of the Torres Strait; they are even more conspicuous than the resident race *carbonarius*, as they often occur in more open habitat.

Knowledge of drongo movements is based mainly on field observations, involving the presence or absence of a species depending on the season, identified distinctions between locally breeding subspecies and visiting races, and visible passage movements. Data derived from ringing operations are few. The development of ringing programmes and an analysis of the limited data available would certainly produce much useful information on the biology of the migratory dicrurids, their exact geographical dispersion, possible changes in their numbers over time, and other topics concerning these mainly common but still not well-known species.

Relationship with Man

Despite being very conspicuous and vocal birds, acknowledged as "short-tempered" and quarrelsome characters in the avian world, drongos are, curiously, not much represented in human cultures across their geographical range. Their remarkable courage in attacking and driving off other birds and animals much larger than themselves has earned them colloquial names in many native languages. In India, the Black Drongo is called the "King Crow" for this reason, and in Madagascar the drongo is referred to as "the king of the forest" in popular legends and beliefs. Congo tribes call the Velvet-mantled Drongo "Nkandongoe", meaning "angry leopard". On Mayotte, the endemic drongo's local name, *Marimoudou*, which means "the black Mary", refers only to the black colour of its plumage, but the bird has the reputation of being very aggressive near its nest and is treated with deference and, indeed, is sometimes feared.

In Australian slang, the name "drongo" has gained the significance of "loser" or "idiot", not because of any connection with the bird's behaviour, but in reference to a famous and unlucky Australian racehorse called "Drongo", which was probably named after the Spangled Drongo. This unfortunate horse never succeeded in winning a single race, having never been able to arrive first at the winning post in its entire career, which spanned the years 1921 to 1925.

The name "drongo", a shortened form of various French alternatives such as *Drongolon* and *Drongri*, is supposedly derived from an indigenous vernacular name used in northern Madagascar, but no current local name can be found to corroborate this, nor is there any etymological explanation to confirm such an origin.

In southern Asia, where up to seven species of drongo coexist, the Black Drongo and the Greater Racquet-tailed Drongo are probably the most popular species. These two are sometimes kept as cagebirds, probably for the beauty of their plumage and their impressive skills in imitating other birds and various other sounds (see Voice).

Black Drongos are significant consumers of insect pests of cultivated plants and trees. Several studies conducted in India, combining stomach-content analysis and observation, have identified this drongo as an efficient predator of arthropods in rice, pigeonpea (*Cajanus cajan*), groundnut and bean fields. In rice agro-ecosystems, about half of the prey taken were phytophagous, including 20% grasshoppers such as *Hieroglyphus banian*; in addition, more than 20% were dragonflies. The Black Drongo is



*The **Sri Lanka Crested Drongo** was until recently considered a race of the Greater Racquet-tailed Drongo* (Dicrurus paradiseus). *Its status has not yet been formally assessed, but this species meets the requirements to qualify as a restricted-range species. It is present only in the shrinking forest remants in the lowland wet zone of the Sri Lanka Endemic Bird Area, a range it shares with the race* leucopygialis *of the White-bellied Drongo* (D. caerulescens). *As the taxonomy of drongos is increasingly undergoing revision, the position of restricted-range subspecies should not be neglected, particularly as some of them may end up being treated as separate species. One case in question is that of the Tablas Drongo* (D. menagei), *hitherto considered a race of the Hair-crested Drongo* (D. hottentottus), *and long believed extinct, until its rediscovery in the late 1990s; it has recently been raised to species status. Its very small population and highly fragmented habitat suggest that it may need to be listed as Endangered or even Critically Endangered.*

[*Dicrurus lophorinus*, Sri Lanka. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]



*Confined to the four main islands of Aldabra and some of their neighbouring islets, the **Aldabra Drongo** is the atoll's only extant endemic bird species, although the status of several other taxa, currently classed as subspecies, is unclear. Nowhere abundant, and with a tiny global range of 154 km² and a population size of only about 1500 individuals, it is particularly at risk from catastrophic events, such as diseases and cyclones. High nest-predation rates may limit the size of its population; this predation could be significantly reduced if introduced rats and cats were to be eradicated. Aldabra is a nature reserve, as well as a World Heritage Site, and the species' habitat is adequately protected, with no apparent decline in numbers reported. It is listed as Near-threatened.*

[*Dicrurus aldabranus*, Aldabra Is.
Photo: A. P. Leventis]

also a major predator of the tobacco caterpillar *Spodoptera litura* in rabi groundnut cultivation, and of the larvae of the scarce bordered straw moth (*Helicoverpa armigera*), often known as the Old World bollworm, in pigeonpea and wheat fields. It is also one of the five main natural predators of white grub (*Holotrichia*), the larvae of several carabid beetles and a damaging subterranean pest of several crops in India, which were found to be reduced by 45–65% following three subsequent ploughings. Provision of perches in fields greatly increased the number of drongos and the number of prey-hunting dives. Such practices have been recommended as an economically cheaper and environmentally safer alternative to the use of pesticides, the latter having, in particular, a negative impact on drongos through their toxicity and by reducing prey abundance.

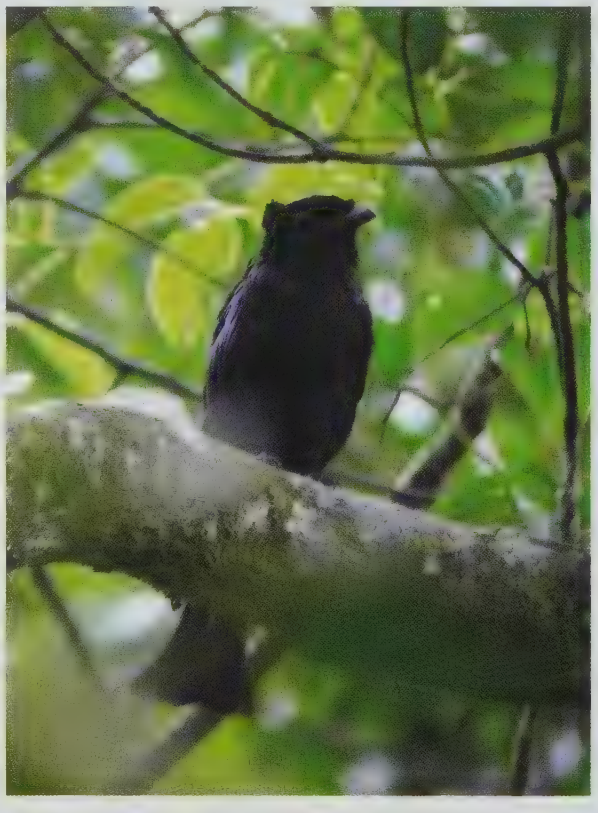
Drongos are efficient predators also of wasps and bees, and can consequently have an adverse effect on honey-producers. Black Drongos and Spangled Drongos are both well known for preying upon bees. The former was reported to be the main predator of honeybees (*Apis mellifera*) after the Little Green Bee-eater (*Merops orientalis*) during the introduction of this bee in south India; both of these drongos are known to capture bees around hives, and up to 52 bees have been found in the crop of a single individual. On the other hand, Black Drongos also help to reduce significantly the numbers of the ferocious rock bee (*Apis dorsata*), which builds its nests under house roofs and can be dangerous to humans; two of the birds consumed up to twelve bees in half an hour. Similarly, Spangled Drongos capture wasps from nests on the walls of houses, and one individual was reported as eating hundreds of wasps over the course of about two days.

Perhaps the most negative event involving a dicrurid is the deliberate introduction by man of the Black Drongo from Taiwan to Rota Island, in the Northern Mariana Islands, in the 1930s in order to control destructive insects. By the early 1960s, the drongos had spread from Rota to colonize nearby Guam. Unfortunately, Black Drongos rapidly became occasional predators of small native passerines such as the Critically Endangered Rota White-eye (*Zosterops rotensis*) and the Endangered Guam Swiftlet (*Aerodramus bartschi*). They may well have played a significant role in the decline of the Rota White-eye and are considered a severe threat to the native forest avifauna of the Northern Marianas.

Status and Conservation

Widely spread across tropical and equatorial forests and savannas of the Old World, and generally common birds, the drongos living in mainland areas are not globally threatened species. Only two island forms are presently in this situation, the Comoro Drongo and the Mayotte Drongo, although future taxonomic studies may reveal more island forms to be added to this list, such as the Tablas Drongo. Three other drongos are listed as Near-threatened; these, too, are insular species, the Aldabra, Andaman and Sumatran Drongos. A further taxon, the Príncipe race of the Velvet-mantled Drongo, is often treated as a separate, monotypic species, and is then also listed as Near-threatened.

For most of the currently recognized drongo species, however, population sizes are not well known, and the lack of evaluation of numbers and trends is general. The Mayotte Drongo, restricted to a small island in the Comoro archipelago, in the western Indian Ocean, was no exception until recent years, when a specific study re-estimated the population size as being at least 2500 pairs, these present largely in forest reserves still threatened by illegal deforestation. This survey used point counts and other density measurements, and yielded figures of 42·4 pairs/100 ha in forest habitat and 10·4 pairs/100 ha in semi-cultivated habitat. Previously considered Critically Endangered, and still now as Endangered, owing to a global population underestimate of only about 100 individuals, the Mayotte Drongo's current status is not so perilous as had been feared and it should probably now be classed as Vulnerable, although it is still threatened by deforestation for cultivation and timber. The human population on the island, already dense, continues to increase, and the majority of the human inhabitants practise traditional food cultivation. In addition, the potential introduction of new nest predators, whether by accident or deliberately, should be treated as an important threat. Severe cyclones hit the island about every ten years, and their effect is often devastating, although the species has been able to recover from such events in the past. A network of 17 forest reserves has been established on Mayotte, and these should assist the species in its survival.



*The **Sumatran Drongo** is currently considered Near-threatened, but an evaluation of its population size and trends is needed in order to review this status, since the species is likely to be declining in conjunction with habitat loss and degradation throughout its range. A restricted-range species, it is found only in Sumatra. Although still fairly widespread, locally relatively common, and apparently tolerant of secondary and logged forests, its total population is undoubtedly smaller and its range more fragmented than in the past.*

[*Dicrurus sumatranus sumatranus*, Sumatra.
Photo: Ron Hoff]



Endemic to the Andaman Islands, the Near-threatened ***Andaman Drongo*** *is still a common resident in a variety of forest habitats. Although its range is very small, forested habitat is still relatively intact in the Andamans, and not so disturbed or fragmented to be of immediate concern. However, there are signs that pressure on forests is increasing. The race* otiosus *of the Greater Racquet-tailed Drongo* (Dicrurus paradiseus) *is also restricted to the Andaman Islands.*

[*Dicrurus andamanensis*, Andaman Is. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]

The status of the Comoro Drongo, currently listed as Endangered, is no better known now than it was in the 1980s, when the population was assessed at about 100 individuals. Despite the total lack of protection of its habitat, however, it is thought not to be declining, primarily because of its apparent adaptation to degraded vegetation and its ability to persist in exotic vegetation. The species is confined to a few areas around the active volcano of Mount Karthala. Although the establishment of a protected area on Mount Karthala has been proposed, no progress has yet been made in achieving this objective.

On Aldabra, the third small island of the western Indian Ocean occupied by an endemic drongo, the status of the species concerned appears better. The Aldabra Drongo has a small population of about 1500 individuals, which is apparently not declining, and its habitat is well protected, Aldabra atoll being virtually uninhabited, and protected by its being a nature reserve as well as a World Heritage Site. A few thousand kilometres away, in the north-east Indian Ocean, the Andaman Drongo is common in wooded habitat of that archipelago. Its population size and trends have yet to be evaluated, its current range to be accurately defined and its conservation status to be reviewed in the light of increasing habitat deterioration. Only two small protected areas, totalling 80 km² of the inland luxuriant tropical forests, are present on these islands. The situation is the same on the much larger island of Sumatra, where the Sumatran Drongo is said to be a fairly common member of mixed-species foraging parties at middle altitudes. An evaluation of this species' population size and trends, on an island subject to severe loss and fragmentation of lowland forest, appears necessary in order to review its current conservation status of Near-threatened. The Tropical Rainforest Heritage of Sumatra covers approximately 25,000 km², a significant proportion of the remaining lowland and mountain forest.

The cases of two other insular species are different, as the taxonomic status of both has recently changed. The endemic Príncipe race of the Velvet-mantled Drongo was hitherto often treated as a full species, distinct from the two continental forms of the species, which are widely distributed in the forests of equatorial Africa. It was previously considered Near-threatened owing to its small range and to harmful changes in agricultural practices. Conversely, the Tablas Drongo, previously considered a subspecies of the Hair-crested Drongo, is now proposed as a full species, restricted to the small island of Tablas, in the central Philippines. Believed probably extinct towards the end of the last century, this drongo was rediscovered in the late 1990s in one of the extremely few and small remaining areas of closed-canopy forest in the north of the island. Its very small population, confined to highly fragmented suitable habitat, must be considered to be Critically Endangered, but it has not been "officially" assessed since the taxon has hitherto been treated only as a subspecies.

The situation of the "Principe Drongo", removed from the list of threatened species because no longer considered a full species, and of the Tablas Drongo, absent from the list because of its subspecies rank at the time, highlights the necessity to take into account the status of all insular forms. Actual numbers are very important for several Australasian taxa, each occurring on one or a few small islands or archipelagos; with such restricted ranges, many of them should probably be considered at least Near-threatened taxa. This applies particularly to the Wallacean Drongo, whose six races occur separately on different islands of the Lesser Sundas. Otherwise, the species most affected by this problem are the Hair-crested Drongo, widely distributed in the Indian Subcontinent, China and South-east Asia, and with ten endemic races on several small islands of the Sundas, the Moluccas and the Philippines, and the Spangled Drongo, occurring mainly in Australia and New Guinea, but with four races on different Moluccan islands, two on two islands of the Solomons and one in part of the Bismarck Archipelago. The Greater Racquet-tailed Drongo, also widespread in India, China and South-east Asia, has two subspecies separately restricted to the Andaman and Nicobar Islands, three confined to small islands in the South China Sea, and one in Java and Bali. The Black Drongo, too, has one race occurring only in Java and Bali. If the Sumatran Drongo is considered Near-threatened because of severe deterioration of its forest habitat, the same consideration could apply to four subspecies of the Ashy Drongo, two in mainland Sumatra and two on small islands of the Mentawai Archipelago, off the western coast, and, to a lesser extend, to one strictly montane race of the Lesser Racquet-tailed Drongo. It is appropriate, for the same reason, to mention the subspecies *viridinitens* of the Sumatran Drongo, which occurs only in the Mentawai Islands.



There are no globally threatened species among the drongos with mainland populations. The two drongo species listed as Endangered are both from small islands of the Comoros, in the Indian Ocean. The ***Comoro Drongo*** *has a highly localized distribution around Mt Karthala, an active volcano on Grand Comoro. In 1985, the population was estimated at around 100 individuals, although a few pairs have since been found elsewhere on the island. Most of the habitat in its range has been degraded, but the Comoro Drongo can persist in exotic vegetation, and does not appear to be declining. Field studies are needed to investigate its biology, range and population, and limiting factors. A protected area has been proposed on Mt Karthala.*

[*Dicrurus fuscipennis*, Grand Comoro, Comoro Is. Photo: Pete Morris]

All of the islands occupied by these different drongos subspecies are situated in equatorial or tropical climatic zones and are normally covered with dense evergreen forest. Most of them are already densely inhabited, and the others are under pressure of increasing human populations and consequent deterioration of natural forest habitat: both permitted and illegal logging, fragmentation of wooded areas, cultivation, mining, the building of new roads and infrastructure, and urban development. The Tablas Drongo illustrates well the potential risk of extinction of a species before its decreasing population has been properly evaluated. As taxonomic positions of drongos come under revision following the findings of various molecular-genetic studies (see Systematics), it seems important not to neglect all the restricted-range taxa of the Dicruridae, including subspecies.

The situation in Sulawesi and Borneo is not very different from that on Tablas. Probably because the highlands of Sulawesi, the regular habitat of this island's endemic drongo, do not suffer from intense degradation, the Sulawesi Drongo is classed as of Least Concern. Its counterpart in lowland forest of the island, the subspecies *leucops* of the Hair-crested Drongo, is facing a rapid increase in agriculture and changes in land use in lowland Sulawesi, a threat to the survival of this spectacular white-eyed drongo. The future of this species' two other white-eyed races, restricted to small islands in the Java Sea, also depends on the extent of the deforestation. In Borneo, a very large island with considerable expanses of threatened forested habitats, three dicrurid species are represented by endemic subspecies, namely the race *borneensis* of the Hair-crested Drongo, the race *brachyphorus* of the Greater Racquet-tailed Drongo, and the race *stigmatops* of the Ashy Drongo, the last being restricted to the mountain areas.

Three other large Asian islands host endemic species and subspecies of drongo and are also threatened by increasing human population and the consequent changes in natural forest habitat. In Taiwan, the race *braunianus* of the Bronzed Drongo, common in the interior mountain forests, possibly benefits directly from the "corridor" of conservation areas established along the central mountains, including the three large national parks of Sheipa, Taroko and Yushan and the three major wildlife habitat areas of Cilan, Danda and Guanshan, together covering a little more than 5000 km², about 14% of the island's total surface area. Another Taiwan endemic is the race *harterti* of the Black Drongo, which occurs in open country and is apparently adapted to farmland and suburban habitat. Off the south-east China coast, Hainan Island represents the entire range of the race *innexus* of the Ashy Drongo and race *johni* of the Greater Racquet-tailed Drongo. No data are available on the status of either, with no estimates of population size or trends. As Hainan is recognized for its evergreen tropical rainforests and monsoon forests, particularly rich in biodiversity, it is the focus of one of the three key projects presented in China: Sustainable Forestry Development Project, a World Bank Document published in 2002, with a view to developing and improving systems of conservation, management and sustainable use of forest resources. The island's two endemic drongos should certainly benefit from such attention to their forest habitat.

The third island is Sri Lanka, divided into two neatly distinct ecological zones, the dry zone and the wet zone, each having two drongos occurring in differing habitat types (see Habitat). Here, too, it is worth noting the change in taxonomic status of the Sri Lanka Crested Drongo, now generally treated as a full species but previously considered to be only an aberrant race of the Greater Racquet-tailed Drongo. *The 2007 Red List of Threatened Fauna and Flora of Sri Lanka* indicates that one in every five species of bird on the island is currently facing the risk of becoming threatened in the wild. This conclusion concerns mainly the lowland wet zone, the range of both the Sri Lanka Crested Drongo and race *leucopygialis* of the White-bellied Drongo, because of the increasing and severe alteration and fragmentation of natural habitats there. The dry zone is less subject to rapid deterioration, and the two taxa concerned, the subspecies *ceylonicus* of the Greater Racquet-tailed Drongo and race *insularis* of the White-bellied Drongo, may benefit from a large number of protected areas in that zone.

Unfortunately, there is a lack of data on population size and trends not only for insular drongos, but also for continental-mainland ones. Only some studies conducted in equatorial Africa appear to have produced measurements of densities for these rather widely dispersed species. In Gabon primary forest, the Shining Drongo, with 12–15 pairs per 100 ha, is commoner than the Square-tailed Drongo, with 7–8 pairs per 100 ha, and is more regular than the Velvet-mantled Drongo, which is recorded at 6–

17 pairs per 100 ha. As expected, the density of the Shining Drongo is lower in Gabon secondary forest, where only 6–8 pairs per 100 ha were found. In mature forest in Liberia, the Shining Drongo is found at 10–20 pairs per 100 ha, whereas the Velvet-mantled Drongo is less common, with up to a maximum of 10 pairs per 100 ha. Studies in southern Africa have confirmed the importance of woodland type for the density of drongo populations: for Fork-tailed Drongos, for instance, densities per 100 ha of 13, 18 and 25 individuals were found in, respectively, mopane, acacia and miombo savannas, or 3–33 birds per 100 ha in different types of acacia woodland.

Limited information on densities is available for the Spangled Drongo. In south-east New Guinea, the subspecies *carbonarius* occurs at a density of 6 birds per 100 ha in a lowland rainforest near Port Moresby. In northern Australia, in north Northern Territory, the race *baileyi* is found at 70–80 individuals per 100 ha in Kakadu National Park, but the figure drops to only 3 birds per 100 ha in South Alligator River area; and in north-east Queensland the nominate race of this drongo occurs at a density of 20 birds per 100 ha.

Only a few members of the family, such as the Fork-tailed Drongo in Africa, the Black Drongo in Asia and the Spangled Drongo in Australia, have adapted well to man-made habitats such as gardens and residential areas. These species may gain from feeding opportunities created by humans, typified by the concentrations of insects around lights at night, from which the more forest-dwelling White-bellied Drongo occasionally benefits (see Food and Feeding). Fork-tailed Drongos, accompanied by rollers, bee-eaters and other birds, commonly attend savanna fires during each dry season in eastern and southern Africa, where they catch insects fleeing from the flames; the same occurs with the Black Drongo in parts of Asia, where fire is frequently used as a management tool. Together with other birds, such as House and Large-billed Crows, Common Mynas and Bank Mynas (*Acridotheres ginginianus*) and Cattle Egrets (*Bubulcus ibis*), Black Drongos readily follow the plough on cultivated fields, seizing insects and annelids disturbed by the machinery. The majority of drongos, however, still require natural habitats for their survival.

This brief analysis of the conservation status of the Dicruridae indicates that a main priority is that of undertaking an evaluation of the population size of each species, and in particular of all restricted-range island species and races. It should be possible, through field studies, to provide information on trends in numbers and range, such information being essential for the detection of declines, and for scientists to propose and justify conservation actions needed in order to improve the status of these birds, especially with the current level of habitat changes induced by the rapid development of human societies. The developing of programmes designed to increase environmental awareness on all islands harbouring a restricted-range species or subspecies and, where appropriate, the encouraging of locally organised ecotourism are two other directions which could be followed.

Drongos are very prominent and popular birds that can be easily used as flagship species for conservation programmes related to tropical forests. This applies in particular to the endangered or rare island forms of Mayotte, Grand Comoro, Aldabra, Príncipe, Tablas, the Andaman Islands and Sumatra. As they are consumers of insects, they can function also as bio-indicators of the health of tropical forests and agro-ecosystems. Nevertheless, despite the fact that most of them are very common and widespread birds, basic aspects of the taxonomy, breeding biology and status of many dicrurids are still poorly known and merit attention from ornithologists internationally.



*Confined to Mayotte in the Comoro Islands, the **Mayotte Drongo** is currently listed as Endangered. It is still commonly found above 200 m around the four mountains that retain large expanses of humid natural forests in the north and centre of the island, and at lower altitudes along the west coast. All these sites of prime natural habitat are protected by law, but steady human population growth has led to illegal clearance, and the introduction of new nest predators is potentially a very serious threat. An old estimate suggested just 100 individuals remained, but point counts and surveys of density in 2002–2004 indicate a minimum population of 2500 pairs.*

[*Dicrurus waldenii*, Mayotte, Comoro Is. Photo: Pete Morris]

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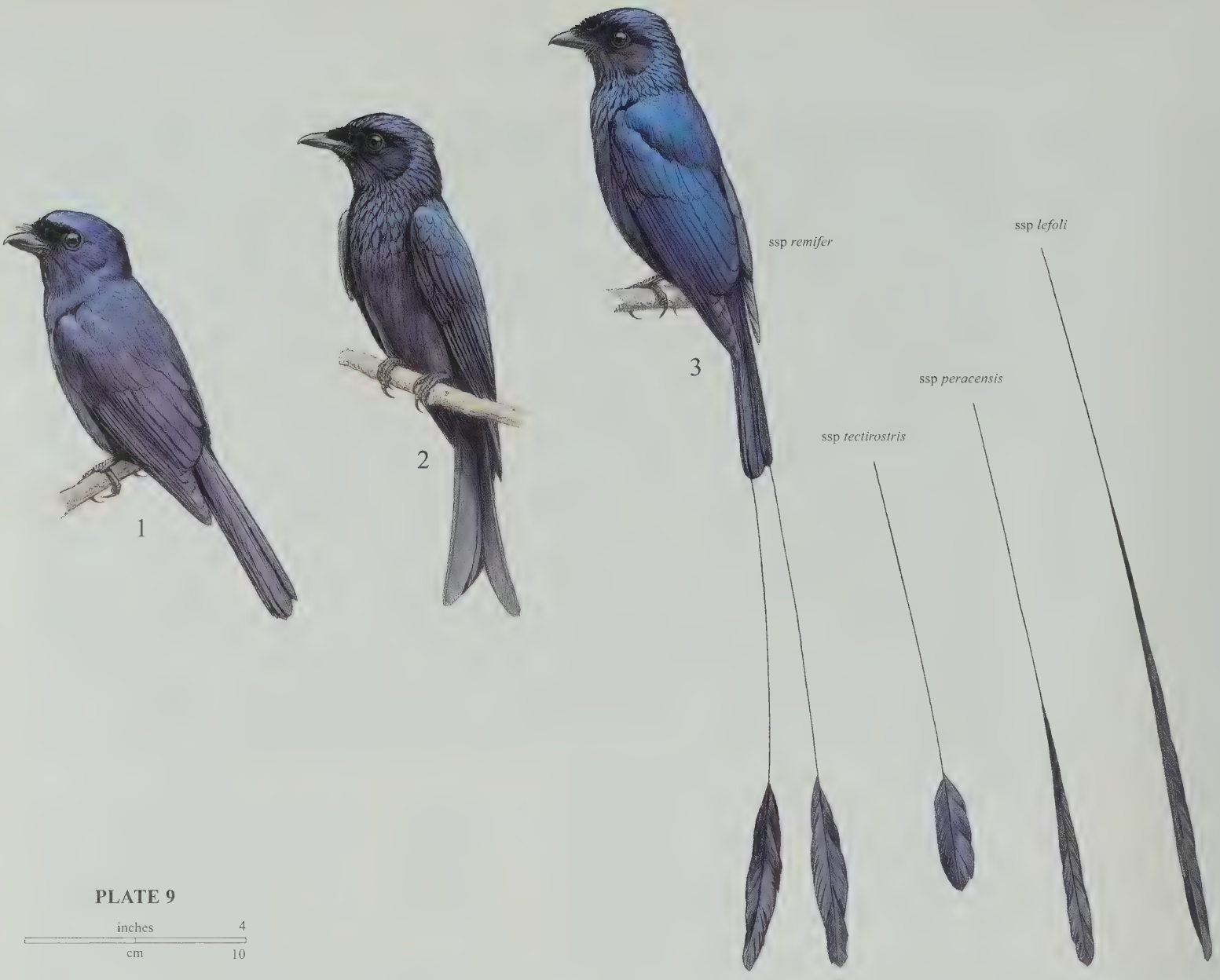


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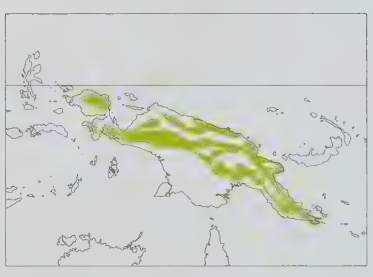
Genus *CHAETORHYNCHUS* A. B. Meyer, 1874

1. **Pygmy Drongo**

Chaetorhynchus papuensis

French: Drongo papou **German**: Rundschwanzdrongo **Spanish**: Drongo Papú
Other common names: Mountain Drongo, Papuan (Mountain) Drongo

Taxonomy. *Chaetorhynchus papuensis* A. B. Meyer, 1874, Arfak Mountains, New Guinea.
Considered the most primitive drongo, differing from *Dicrurus* in having twelve (not ten) rectrices. Recent molecular-genetic study, however, indicates that genus may belong in fantail family (Rhipiduridae). Clinal variation in size, W populations (mean male wing measurement 122 mm) on average larger than those in SE (118 mm), with intermediate values in intervening regions. Monotypic.
Distribution. Mountains of New Guinea.
Descriptive notes. 20–22 cm, including tail 9–10 cm; male 36–45 g, female 27–39 g. A small sooty-black drongo with tail slightly rounded (not forked), rather short bill strongly compressed, upper mandible strongly hooked, rictal bristles very long. Has frontal band pure velvety black, slight crest of brilliant purple-blue; glossy steel-blue feathers on upperparts, becoming faint on flanks and belly; concealed white patch at base of scapulars; iris brown; bill and legs black. Sexes similar, female a little smaller than male; central tail feathers exceed outer ones by 1–9 mm for male, 1–11 mm for female. Immature is duller than adult and has white gape. Voice. Noisy. Song an explosive, rapid jumble of varied short notes, many squeaky and metallic, some lower and nasal, duration 4·5–5 seconds; another song a beautiful melodious mixture of loud whistles, squeaks, chirps and warbles. Calls include mildly explosive jangle of notes; rapid metallic ticking, "sick-tsick, ts-ts-tsik-tsik" or "tsei-tsutsutsutsu"; single strong and metallic "tsei", or "peep", repeated 5–7 times; multisyllabic slur, descending and then rapidly rising, initially harsh and buzzy, ending with clear and squeaky notes; occasionally short nasal, squeaky notes, "cha-cha-cha, chep, chep-pip" and "sscsh-sschsh-tchick". Often utters explosive calls when flushed. Captured individual, when released, uttered low, monotone fantail-like note as it flew away.



Habitat. Hill forests from 200 m to 1600 m, mainly 600–1400 m; typical bird of forest interior. Altitudinal ranges of this species and *Dicrurus bracteatus* seem to be nearly mutually exclusive, latter occurring in lowland forest.
Food and Feeding. Feeds on insects and spiders (Araneae). Hunts in middle stage of forest. Typically, perches upright on horizontal branch, tail pointing straight down, often wingtips hanging below tail; sometimes flicks tail from side to side or upwards. Captures prey by sallying in middle and lower strata. Has been reported as behaving in manner of monarch-flycatcher (Monarchidae) or fantail. Forages alone or in small groups, joining mixed flocks of e.g. Old World warblers (Sylviidae), fantails and monarch-flycatchers; flock-leader species changes according to altitude, generally Rusty Pitohui (*Pitohui ferrugineus*) up to 600 m, Variable Pitohui (*Pitohui kirhocephalus*) at c. 600–1000 m, Hooded Pitohui (*Pitohui dichrous*) c. 1100–1300 m and Black Pitohui (*Pitohui*

nigrescens) from 1200 m to at least 1700 m. Present species benefits by taking insects flushed by flock-members, but may also force other birds to give up captured insects. On the other hand, acts as sentinel, giving alarm at approach of predators. Reported as following Buff-tailed Sicklebill (*Drepanornis albertisi*) while foraging on bark and epiphytes; sometimes follows human observer.
Breeding. Nest a small shallow basket, hung from tree fork. No other information available.
Movements. Resident.
Status and Conservation. Not globally threatened. Fairly common to scarce, and widely distributed. In W & C New Guinea, traditional tribal lifestyle has had little impact on ecosystems, but situation changing as a result of extensive logging concessions and shifting human populations; road-building also resulting in new settlements, followed by further deforestation for agriculture and timber. In S of range large areas are inaccessible, but new roads under construction for development of mining (copper, gold) and large commercial logging operations. In NW & W, the species may benefit from several protected areas, e.g. Foja Nature Reserve (c. 10,000 km²), covering complete altitudinal range of lowland to montane forest.
Bibliography. Barker *et al.* (2004), Beehler (1978b), Beehler *et al.* (1986), Coates (1990), Diamond (1987b), Stattersfield *et al.* (1998), Vaurie (1949).

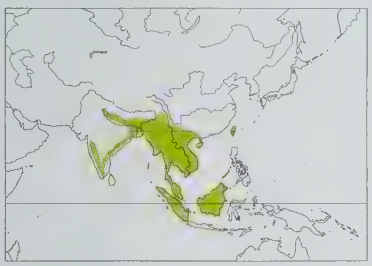
Genus *DICRURUS* Vieillot, 1816

2. Bronzed Drongo

Dicrurus aeneus

French: Drongo bronzé **German**: Bronzedrongo **Spanish**: Drongo Bronceado

Taxonomy. *Dicrurus aeneus* Vieillot, 1817, India.
Formerly placed in a monotypic genus, *Chaptia*. Appears similar to *D. remifer* in general plumage characteristics (apart from absence of racquets); possibly originates from an ancient form related to *D. annectans*. Clear trend of decreasing size from N to S. Nominate race intergrades with *malayensis* in C Peninsular Malaysia (Pahang and N Selangor). Three subspecies recognized.
Subspecies and Distribution.
D. a. aeneus Vieillot, 1817 – Indian subcontinent (Himalayan foothills E from Uttar Pradesh, S through hills of Bangladesh to Eastern Ghats, and Western Ghats S from R Tapti), SE Asia (S to C Peninsular Malaysia), and S China (SE Xizang, W & SW Yunnan, S Guangxi, Hainan).
D. a. braunianus (Swinhoe, 1863) – interior mountains of Taiwan.
D. a. malayensis (Blyth, 1846) – C Peninsular Malaysia, Sumatra and Borneo.



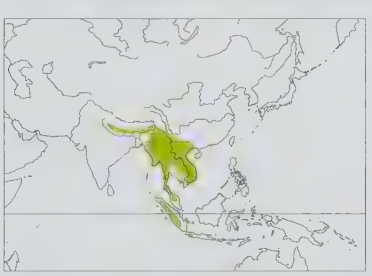
Descriptive notes. 23–24 cm; 22–30 g. A small drongo with glossy plumage, well-forked tail, and very depressed and flattened bill; feathers of crown, hindneck and upper breast long and pointed (but not becoming hackles). Nominate race is black, strongly glossed metallic blue-green or purple (depending to light) on crown, nape, mantle and breast (elongated feathers with gloss limited to tips), especially spangled on throat; frontal band, chin and upper throat, flanks and belly to undertail-coverts deep matt black; rump often grey; slender tail (105–131 mm) has central feathers black, glossed green, outer feathers black, depth of fork 19–39 mm; iris dark reddish-brown or crimson; bill and legs black. Sexes similar in plumage, male a little larger than female. Juvenile has upperparts duller and less heavily spangled than adult, is uniformly sooty brown and initially not spangled below, iris brown; first-winter has white spotting on breast, belly, flanks and underwing-coverts, and less forked tail (sometimes looking square-ended). Race *malayensis* is smaller than nominate (tail 90–111 mm), with tendency to be slightly glossier, particularly on rump, belly very dark grey, axillaries and underwing-coverts with a few white spots; *braunianus* is largest (tail 117–130 mm), has resplendent deep metallic bluish-green on upperside, plumage somewhat smoky on belly, white spots on axillaries, bill shorter and much broader than nominate and well covered with feathers. Voice. Noisy and demonstrative during breeding season, less so otherwise; reported as singing on moonlit nights in Thailand. Song pleasant, with varied short phrases of loud musical whistles or harsh notes, rapid chatters, downstrokes and twangy notes, nasal churrs and rolling strophes. Calls include a dry sound followed by 2 quick high-pitched nasal notes, "gzrrt nyip-nyip"; downslurred whistles, "sleeurk, sleeurk", produced by pairs or trios; loud continuous chorus of sharp or harsh notes given by groups in Bhutan. Much mimicry of raptors, such as Crested Serpent-eagle (*Spilornis cheela*) in Malaysia, also of upland passerines e.g. Javan Cuckoo-shrike (*Coracina javensis*) and Orange-bellied Leafbird (*Chloropsis hardwickii*).
Habitat. Occupies all kinds of forest or wooded habitats (except sometimes the deepest and wettest): broadleaf evergreen and moist-deciduous forest, mixed bamboo-jungle, secondary growth, forest edge, also tea, coffee and rubber (*Hevea*) plantations; fruit gardens in Kerala (SW India); subcostal peatswamp-forest in S Thailand and Peninsular Malaysia; teak (*Tectona*) or oak (*Quercus*) and pine (*Pinus*) forests, depending on altitude, in Myanmar; confined to primary forest in Borneo. In Himalayas occurs in foothills, in Nepal occasionally up to 2100 m (usually below 1200 m in winter); hills, probably to 1400 m, in Sumatra; recorded at maximum of 1500 m in Malay Peninsula; to 2000 m in China, and apparently restricted to mountainous regions up to 2000 m in Taiwan. Avoids more open habitat, but reported as breeding near a village.
Food and Feeding. Mainly insectivorous; prey include flies (Diptera), Hymenoptera and Lepidoptera. Reported as consuming flower nectar. Hunts in canopy, including crown of giant emergent trees, in open spaces or edges of forest, and on edge of cultivated areas in Malay Peninsula. Hawks winged insects, making short sallies, and often swooping close to ground, then looping back to same perch; also makes vertical sorties from treetop, diving back with wings held closed after a capture. In Malaysia, reported as perching on small trees or bamboo and hawking after prey from them, usually at middle-storey level; in Borneo often seen on rivers, skimming water to catch flies in manner of a swallow (Hirundinidae). Along forested or wooded margin of small roads, utilizes wires as still-hunting perches. Usually seen singly or in pairs (members of which widely separated); also a regular member of mixed feeding parties of insectivorous birds.
Breeding. Season mainly Apr–May, but also in Feb in SW India (Kerala), Mar in Nepal and to Jun in N India (Sikkim). Nest built by both parents (in Borneo observed to operate with great precision, in perfect collaboration), a shallow irregular cup, extremely compact, of various materials, e.g. bark and decayed wood lined with dead strips of small vine in Malay Peninsula, fine grass, fibre and a few dry bamboo leaves in India, plantain (*Musa*) leaves and jute in E India, well felted and cemented together, and fixed in branch fork with plant fibres and cobwebs; size varying from large (external diameter and depth 10·2–12·3 cm × 5·1–7·2 cm) to, more often, small (externally 8·9 cm across and 5·1 cm deep, internally 6·3 cm wide and 3·8 cm deep), with generally very thin interior (nest can look fragile but is really very strong, as well put together and strengthened with covering of spider webs); suspended in hammock fashion 2–6 m above ground in small fork of slender branch in outer part of tree, preferentially above water or track, or in bamboo, either on hanging and waving spray of bamboo (9–15 m high) or among mass of upright twigs growing from lower nodes between 1·5 m and 4·5 m; in Assam (NE India), often in rather small tree standing in thin open scrub-jungle or at the edge of forest surrounding tea estates. Clutch generally 4 eggs, occasionally 3, pale pinkish-fawn to pale salmon-pink with irregular zone of dark cloudy spots, sometimes reddish or purplish, around broad end (rarely, spots distributed over whole surface and more numerous at larger end); average 21·1 × 16·1 mm (nominate race), 21 × 15·7 mm (*malayensis*) and 25·5 × 20 mm (*braunianus*); incubation by both sexes, period 13 days; both also feed chicks, no information on duration of nestling period.
Movements. Resident; in highest parts of range, e.g. in Nepal, generally makes post-breeding descent to lower levels.
Status and Conservation. Not globally threatened. Common and widespread in most of range. Fairly common in Himalayan area; common in Western Ghats, and locally common in Bangladesh; the most common forest drongo in N Myanmar and common in S China. Common in Thailand, where present in several protected areas, e.g. Khao Yai National Park, and more or less common in N & C Malay Peninsula (recorded in Pasoh Forest Reserve); widespread in Indochina, and reported (at least until 1970s) as common in dense forests in Cambodia. Race *malayensis* is common resident throughout lowlands of S Malay Peninsula, but extinct in Singapore since 1950s; common also in Sumatra and throughout lowlands of Borneo. In Taiwan, *braunianus* uncommon except in mountainous forested regions, where reported as common; an increasing area of lower slopes (to 1000 m, but mainly 100–500 m), however, is intensively cultivated and faces continuing forest destruction.
Bibliography. Ali (1969), Ali & Ripley (1987a), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1987), Étchécopar & Hüe (1983), Grimmett *et al.* (1998), Hume & Oates (1889), MacKinnon & Phillipps (2000), van Marle & Voous (1988), Meyer de Schauensee (1984), Robson (2000), Smythies (1986), Smythies & Cranbrook (1981), Stattersfield *et al.* (1998), Strange (2000), Stuart Baker (1924, 1933), Swinhoe (1863), Vaurie (1949), Wells (2007).

3. Lesser Racquet-tailed Drongo

Dicrurus remifer

French: Drongo à rames **German**: Spateldrongo **Spanish**: Drongo de Raquetas Chico

Taxonomy. *Edolius remifer* Temminck, 1823, Java.
In the past, sometimes separated in a monotypic genus, *Bhringa*, characterized by morphology of outer pair of tail feathers. Has previously been considered to be closely related to *D. aeneus* on account of very similar plumage characteristics (except racquets), an hypothesis compatible with findings of recent DNA studies. Races intergrade wherever they come into contact: *peracensis* with *tectirostris* in W Thailand (Ban Rahaeng region), Vietnam (C Annam) and S Laos (Bolovens Plateau), and with *lefoli* on Thailand–Cambodia border. Four subspecies recognized.
Subspecies and Distribution.
D. r. tectirostris (Hodgson, 1836) – lower Himalayas from N India (E from Garhwal and Kumaon) E to Arunachal Pradesh, Assam, Nagaland, Manipur and Mizoram, E Bangladesh, S China (SE Xizang, W & S Yunnan and SW Guangxi), Myanmar (except extreme S), N Thailand, N Laos and N Vietnam (S to Huè).
D. r. peracensis (Stuart Baker, 1918) – S Myanmar (Tenasserim) and SW Thailand S to N Peninsular Malaysia (S Selangor and S Pahang), S Laos and S Vietnam (S to S Annam).
D. r. lefoli (Delacour & Jabouille, 1928) – mountains of S Cambodia (Cardamom and Elephant Ranges).
D. r. remifer (Temminck, 1823) – Sumatra (Barisan Range and Batak Highlands) and W Java.



Descriptive notes. 26 cm, excluding outermost tail feathers (c. 30–40 cm to end of tail); five males 39–49 g, 5 females 35·5–44 g (*peracensis*); four males 48–51 g (*tectirostris*). Distinctive black drongo, characteristic square tail having greatly elongated bare-shafted outermost pair of rectrices; tuft of frontal feathers very dense and brush-like, projecting forwards to cover greater part of bill and producing flat-looking head. Nominate race has entire upperside black, with extremely metallic and brilliant gloss which changes from green to bluish or purple according to light; centre of throat to breast black but highly spangled, frontal feathers, cheek, lores, chin, side of throat and belly velvety black, flanks without gloss and silvery grey; underwing-coverts and axillaries with small white tips; shaft of outermost pair of rectrices completely bare and wire-like from level of central feathers, except for barbs on both sides distally, forming long, narrow paddle-like spatula or racquet, webs of which taper on to shaft for short distance (central rectrices 104–116 mm; outer rectrix 392–453 mm, bare shaft 150–246 mm); iris red or brownish-crimson; bill and legs black. Female is similar to male but smaller, with shorter tail including similar racquets. Juvenile lacks both frontal brush and racquets, has tail slightly forked, gloss below restricted to small spangles on throat and in band across upper breast, axillaries broadly tipped white, iris brown; typical long racqueted rectrices acquired at next moult, when gloss appears above and extends farther below, white spots on axillaries still numerous but become smaller, frontal brush developing; adult plumage complete after third moult. Races differ mainly in size and shape of tail-racquets: *tectirostris* has broad racquets starting abruptly from shaft, central rectrix 117–129 mm, outer rectrix 402–532 mm, bare shaft 182–306 mm, length of racquet 81–120 mm, width of racquet 21–30 mm; *peracensis* is similar to nominate, but distal webs on outer rectrix arise more gradually from shaft, and racquet becomes both very long and narrower, cigar-shaped (length 154–228 mm, width 14–20 mm); *lefoli* has web on outer rectrix occupying three-quarters of length of shaft and racquet rather long, narrow and streamer-like (bare shaft 125 mm, length of racquet 330 mm). Voice. Has one of the most extensive repertoires of all drongos. Extremely varied vocalizations include musical and metallic whistles, short plaintive, downslurred, sweet notes, loud harsh rattle sounds and discordant downslurred "kreer" whistles, mechanically repeated or in irregular series, also warbling strophes and many other melodious or raucous sounds; also explosive clear piping "keep" notes, and sequence of 7 bell-like notes within an octave, "doh-ray-mee-

doh-ray-mee-doh", or doubled as "cheek-cheek, bo-peep, bo-peep, cheek-cheek"; large amount of mimicry of many other mountain and forest bird species, e.g. woodpeckers (Picidae), leafbirds (*Chloropsis*), bulbuls (Pycnonotidae), Old World warblers (Sylviidae) and others.

Habitat. Humid broadleaf evergreen and deciduous forest; frequents shaded edge of openings, fire-lines, cultivation clearings and forest streams, also dry open woodlands and bamboo-jungle in China. Occurs at 900–2000 m in Indian Subcontinent; from lowlands to 1200 m (mostly 450–750 m) in Myanmar, but common also from 900 m to 1800 m in SE (Karen area); from foothills to 1800 m in China; not below 450 m in Malay Peninsula; 600–2500 m, principally 1200–1800 m, in Sumatra and Java. Replaces *D. paradiseus* at higher elevations, but overlaps with it at lower altitudes.

Food and Feeding. Mainly insectivorous; beetles (Coleoptera), Lepidoptera, alate termites (Isoptera) and other winged insects recorded in diet, as also are spiders (Araneae). Also takes flower nectar. Typically arboreal, within dense foliage of canopy. Hawks prey principally beneath canopy, dashing in bold swoop from perch, to which it returns after each sortie, generally flying slowly, long tail feathers undulating through air; capable of great speed in pursuit of termites on the wing. Forages singly and in pairs; often associates with mixed-species flocks, including those with *D. paradiseus*.

Breeding. Season mainly May, also Apr and Jun. Nest built by both sexes, a small shallow cup made of fine roots or other vegetable fibres and pliable stems, bound together or around twigs of branch fork with finer fibres and few cobwebs, outside diameter 7·5–11 cm, inside depth 2·5–4 cm, often scarcely more than 5 mm thick at bottom and looking like a thick network roughly built (contents visible through all sides), old nest sometimes taken apart and material reused; suspended from fork of small branch, usually less than 7 m from ground, occasionally within reach of human hand, seemingly mainly close to open place where ample light and sunshine (which increase the numbers of aerial insects, a main food source), e.g. jungle-clad ravine surrounded by tea or other plantation, patches of cultivation in forest, open glade alongside river. Clutch 3 or 4 eggs, warm salmon-pink to terracotta, with blurred blotches of darker terracotta, fairly dense at larger end, or dark reddish-brown mixed with secondary grey marks over whole surface (rarely, white to pale salmon-pink or yellowish-pink with variety of pale purplish-brown or reddish spots, blotches or freckles), average size 25·5 × 18·4 mm; incubation and brood-tending by both sexes, no information on duration of incubation and nestling periods; fledglings cared for by both parents.

Movements. Mainly resident; local post-breeding descent from higher elevations in Himalayas. Breeding summer visitor in parts of S China.

Status and Conservation. Not globally threatened. Locally common in Indian Subcontinent; in Myanmar, widespread in suitable forest in N & E, rare in S, confined to bamboo in higher Karen areas but quite common in Karen Hills and Karenni; in Thailand, local in W (recorded in Huai Kha Khaeng Wildlife Sanctuary) but absent from C; locally common in China. In Peninsula Malaysia, race *peracensis* regular and common, present in still extensive habitat, but more dependent on closed forest than are other local drongos. Nominate race possibly threatened by deterioration of forest habitat in Sumatra, where loss of lowland forest already extensive. Race *lefoli* has very small range, restricted to mountains of S Cambodia; requires research to determine exact distribution, numbers and trends.

Bibliography. Ali & Ripley (1987a), Chen Fuguan *et al.* (1998), Étchécopar & Hüe (1983), Grimmett *et al.* (1998), Hume & Oates (1889), MacKinnon (1988), MacKinnon & Phillipps (2000), McClure (1998), Meyer de Schauensee (1984), Pasquet *et al.* (2007), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Strange (2000, 2001), Vaurie (1949), Wells (2007), Yan Chongwei & Xu Weishu (1996).

PLATE 10 ➤


4
6
ssp brachyphorus
ssp platurus
5
ssp paradiseus
ssp grandis
7
ssp leucops
8
9
ssp striatus
ssp hottentottus
10
11
13
ssp mirabilis
ssp balicassius
12
ssp densus
ssp megalornis
ssp bimaensis
ssp carbonarius
14
15
ssp bracteatus
ssp longirostris
PLATE 10
inches 5
cm 13

4. Andaman Drongo

Dicrurus andamanensis

French: Drongo des Andaman **German**: Andamanendrongo **Spanish**: Drongo de Andamán **Other common names**: Small Andaman Drongo (*andamanensis*); Large Andaman Drongo (*dicruriformis*)

Taxonomy. *Dicrurus andamanensis* Beavan, 1867, Port Blair, Andaman Islands.
In the past sometimes placed in genus *Dissemuroides*. Considered closely related to *D. paradiseus*, having similar plumage. Exhibits apparent cline of decreasing size from N to S, with birds of intermediate size on Middle Andaman; species possibly better treated as monotypic. Two subspecies provisionally recognized.
Subspecies and Distribution.
D. a. dicruriformis (Hume, 1873) – Great Coco I, Table I (N Andamans).
D. a. andamanensis Beavan, 1867 – all main islands of Andamans.



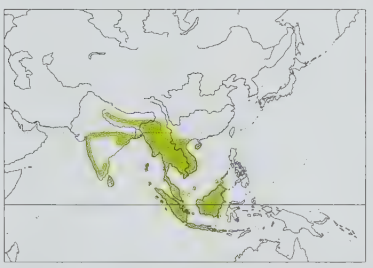
Descriptive notes. 28–29 cm (nominate), c. 35 cm (*dicruriformis*). Distinctive glossy drongo with deeply forked long tail, large black bill with sharply hooked upper mandible, at base of which a straight or back-curving tuft c. 2 cm long of thin hairy filaments (distinctly barbed to the tips); feathers on each side of neck slightly elongated (not enough to form hackles). Male nominate race is black, except for brownish primaries, and velvety black abdomen, flanks and undertail-coverts; whole plumage glossed with green, but gloss on lower throat and upper breast more limited to end of feathers (tending to form vague and sober spangles); wing-linings silvery brown (paler than upperwing), axillaries and underwing-coverts tipped white; tail long (153–167 mm), rather deeply forked (47–58 mm), outer pair pointed and strongly curved upwards, four inner rectrices becoming progressively shorter towards central pair; iris deep brown or blackish; bill and legs black. Female is similar to male, but a little smaller, with less deeply forked tail. Juvenile is browner and less glossed than adult, lacking frontal filament, has more white tips on axillaries and underwing-coverts, tail initially more square-ended. Race *dicruriformis* is similar to nominate but much larger, tail 150–182 mm, depth of fork 62–70 mm. Voice. Song a uniform series of repeated strophes of loud, jangling, syncopated groups of notes, first dull and clipped, last notes metallic and bell-like. Calls include loud, liquid "tseep" repeated monotonously for several minutes, and single, very short, hard, squeaky jangles; also a fast "shleeup", starting as harsh hissing buzz and finishing in short jangle. Jerks tail upwards slightly after each note.
Habitat. Evergreen and broadleaf tropical moist lowland forests and edges; open forest and scrub-jungle. In N of range, jungle immediately within belt of coconut palms (*Cocos nucifera*) surrounding coast.
Food and Feeding. Mainly winged insects, including ants (Formicidae). Prey caught mostly by aerial hawking. Frequently perches head upwards on vertical trunk, in manner of a woodpecker (Picidae), pressing tail against bark and ascending in flitting hops to take ants. Gregarious, in flocks of a dozen to 20 individuals; often forages with other species, including e.g. Asian Fairy-bluebird (*Irena puella*), White-headed Starling (*Sturnia erythropygia*), Bar-bellied Cuckoo-shrike (*Coracina striata*), Small Minivet (*Pericrocotus cinnamomeus*). Parties also often seen to follow groups of primates and catching large insects disturbed by them.
Breeding. Nests found from early Apr to mid-May. Nest a shallow cup or cradle composed of fine dry twigs firmly woven together, scantily lined with black hair-like rhizomorphs, bound to the support by spider webs; suspended 4·6–9 m above ground from forked twig of very large forest tree, generally a dry or leafless one, or, more rarely, of small tree standing in open forest or scrub-jungle. Clutch 2 or 3 eggs, very variable (at least half a dozen types), commonest having pale salmon-pink ground colour spotted all over with pale brownish and some underlying spots of pale grey, other types white with purple-brown spots, streaks or speckles in zone at large end, average size 24·8 × 18·3 mm. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Andaman Islands EBA. Common. Although this species' habitat is relatively intact and it appears to be reasonably numerous throughout its range, it is potentially at risk owing to the small size of its global range and indications of increase in human pressure (increasing human population, cultivation, grazing, logging, development). Some evergreen and deciduous forests in Andamans are protected, e.g. Mount Harriet and Saddle Peak National Parks (covering c. 80 km²).
Bibliography. Ali & Ripley (1987a), Anon. (2008i), Butchart & Stattersfield (2004), Collar *et al.* (2001), Grimmett *et al.* (1998), Rasmussen & Anderton (2005a, 2005b), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Stuart Baker (1924, 1933), Vaurie (1949).

5. Greater Racquet-tailed Drongo

Dicrurus paradiseus

French: Drongo à raquettes **German**: Flaggendrongo **Spanish**: Drongo de Raquetas Grande **Other common names**: Large Racquet-tailed Drongo; Northern Large Racquet-tailed Drongo (*grandis*); Southern Large Racquet-tailed Drongo (*paradiseus*); Ceylon Large Racquet-tailed Drongo (*ceylonicus*); Andaman Racquet-tailed Drongo (*otiosus*); Nicobar Racquet-tailed Drongo (*nicobariensis*)

Taxonomy. *Cuculus paradiseus* Linnaeus, 1766, Thailand.
In the past sometimes placed in genus *Dissemurus*. May form a superspecies with *D. lophorinus*; often treated as conspecific, but differs in tail morphology and probably in voice. Molecular-genetic studies required in order to elucidate true relationship between the two. Few intergrades between Sri Lanka race *ceylonicus* and *D. lophorinus* reported in past along border between wet and dry zones, but interbreeding not now possible, since suitable habitat no longer remains between the two ecological zones, now completely separated. Geographical variation based mainly on biometrics, but exhibits parallel clinal decrease in size from N to S in both W & E parts of range. Race *rangoonensis* intergrades with *grandis* in N and with nominate in S; birds from C & S India described as race *malabaricus*, but considered intermediates; *hypoballus* intergrades with nominate in N of its range and with *platurus* in S; proposed race *adelphus* (from Nias I), described on basis solely of difference in wing measurements, synonymized with *platurus*; island races (including those in Borneo) very similar to one another. Further studies would probably lead to reduction in number of accepted races. Thirteen subspecies currently recognized.
Subspecies and Distribution.
D. p. grandis (Gould, 1836) – S foothills of Himalayas from N India (Kumaon) E to extreme N Assam, N Myanmar (S to N Chin Hills and N Shan States), S China (extreme SE Xizang, W & S Yunnan) and N Indochina.
D. p. rangoonensis (Gould, 1836) – C India, Bangladesh, C & S Myanmar (S Chin Hills, S Shan States S to N Tenasserim), N & NE Thailand, C Laos and C Vietnam.
D. p. paradiseus (Linnaeus, 1766) – S peninsular India, S Myanmar (Tenasserim and Mergui Archipelago), SW, C & SE Thailand and S Indochina.
D. p. ceylonicus Vaurie, 1949 – N, E & S Sri Lanka.
D. p. otiosus (Richmond, 1902) – Andaman Is.
D. p. nicobariensis (Stuart Baker, 1918) – Nicobar Is.
D. p. johni (E. J. O. Hartert 1902) – Hainan I (S China).
D. p. hypoballus (Oberholser, 1926) – Malay Peninsula (except S).
D. p. platurus Vieillot, 1817 – Peninsular Malaysia S of 4° N (including islands except Tioman I), Sumatra (including Simeulue, Banyak Is and Nias I), Riau Archipelago, Lingga Archipelago and Bangka I.
D. p. microlophus (Oberholser 1917) – islands in S China Sea (Tioman I, Anambas Is and N Natunas).
D. p. banguey (Chasen & Kloss, 1929) – Balambangan I and Banggi I, off N Borneo coast.
D. p. brachyphorus (Bonaparte, 1850) – Borneo, including Laut I (off SE coast).
D. p. formosus (Cabanis, 1851) – Java and Bali.



Descriptive notes. c. 30–65 cm (total length varying greatly, depending on tail length); three adults 74–85 g (nominate), three males 100–124 g (*grandis*), two adults 71–73 g (*ceylonicus*). A large, distinctive drongo characterized by presence of two wire-like twisted spatula-tipped streamers in tail (tip broadly webbed on inner side of shaft, very narrowly on outer side); generally a backward-curving tuft or crest on forehead, more or less developed. Nominate race is black with fairly strong metallic blue or greenish-blue gloss (except on quills, lower abdomen and flanks), breast spangles rather small and not sharply defined, trace of gloss on edges of crest feathers and on outer webs of primaries and rectrices; feathers around neck, when well developed, form glossy cape covering shoulders; elongated frontal feathers form backward-curling crest with mean length of 24 mm (longest feathers reaching to posterior part of crown); average length of central rectrix 138 mm, of outermost rectrix 393 mm, of tail-racquet 89 mm; iris blood-red; bill and legs black. Sexes similar. Immature is browner and less glossy than adult, with white fringes on feathers of abdomen and undertail-coverts and white tips of axillaries rather broad and abundant, tail shorter, racquets poorly developed, crest rudimentary, iris brown; subadult less glossy than adult, crest not so well developed, tail-racquet smaller and not so curly, narrow fringes of white on undertail-coverts and abdomen, axillaries tipped with white (this marking persisting, but spots much smaller and fewer, in otherwise perfectly adult birds). Races vary mainly in presence or absence of crest, shape of crest, length and shape of outer tail feathers, various other measurements, least variable being those of bill, wing and central tail feather (figures below are average measurements): *grandis*, with prominent cape, is largest in all average measurements, central rectrix 157 mm, outer rectrix 498 mm, tail-racquet 103 mm, crest 58 mm (frontal feathers longer and more erect than in S races and main feathers broader and longer, reaching nape or beyond); *rangoonensis* is smaller, with breast spangles large and sharply defined, pointed feathers at side of neck forming well-developed cape, central rectrix 146 mm, outer rectrix 400 mm, racquet 95 mm, very large crest 42·5 mm (reaching well beyond crown); *ceylonicus* is similar to nominate but smaller, with breast spangles less well defined and a shorter cape, central rectrix 133 mm, outer rectrix 268 mm, racquet 79 mm, shorter crest 22 mm (feathers reaching only top of crown), immature has outer rectrix almost fully webbed, subadult has shaft bare, with narrow fringe of barbs persisting on both sides, and straight; *otiosus* is large, identical to *rangoonensis* except for little or no crest, central rectrix 144 mm, outer rectrix 407 mm, racquet 98 mm, bill powerful and long; *nicobariensis* is very similar to nominate, from which distinguishable only by having smaller tail-racquet; *johni* differs from *grandis* and *rangoonensis* in having crest more upward-curving, softer, lacking hairy frontal plumes, and in having main feathers broader and less pointed, shoulder cape less prominent, central rectrix 144 mm, outer rectrix 415 mm, racquet 89 mm, crest 52 mm; *hypoballus* has glossy feathers of breast arranged into well-defined spangles, pointed feathers at side of neck forming short cape, frontal feathers forming short but well-developed crest, central rectrix 124 mm, outer rectrix 333 mm, racquet 74·5 mm, crest 16 mm; *platurus* is similar to previous, except that elongated frontal feathers mostly directed upwards, forming bushy tuft, more rarely a short crest sometimes curving backwards, but exceptionally a little larger in general measurements, with racquets a little less long and broad, central rectrix 126 mm, outer rectrix 350 mm, racquet 70·5 mm; *brachyphorus* is smallest of all races, central rectrix 116 mm, outer rectrix 301 mm, racquet 51·5 mm, lacks crest, has small bristly frontal plumes projecting forward over ridge of culmen, ill-defined spangles on breast (also, tendency for abnormal development of outer tail feathers, including lack of racquet, feather either shorter than or equal to rest of tail, or more or less fully webbed); *banguey* is very similar to previous, but with longer wing; *microlophus* is considerably larger than *brachyphorus* (but size variable, depending on island), a few frontal feathers showing tendency to point upwards and forming short bushy tuft (absent on many specimens), gloss on breast feathers restricted to tips and tending to form spangles; *formosus* is distinct from all other races in small size, rather short but developed crest curving backwards on to crown, long tail-racquets, central rectrix 128 mm, outer rectrix 343 mm, racquet 97 mm, crest 15 mm. Voice. Very noisy, with large variety of vocalizations, extremely long and diverse chatters, including mimicry; starts to call long before dawn, a monotonous "kit-kit-kit-kit-kit...", almost

On following pages: 6. Sri Lanka Crested Drongo (*Dicrurus lophorinus*); 7. Crow-billed Drongo (*Dicrurus annectans*); 8. Hair-crested Drongo (*Dicrurus hottentottus*); 9. Tablas Drongo (*Dicrurus menagei*); 10. Sulawesi Drongo (*Dicrurus montanus*); 11. Sumatran Drongo (*Dicrurus sumatranus*); 12. Wallacean Drongo (*Dicrurus densus*); 13. Balicassiao (*Dicrurus balicassius*); 14. Spangled Drongo (*Dicrurus bracteatus*); 15. Ribbon-tailed Drongo (*Dicrurus megarhynchus*).

continuously until sunrise, then producing large repertoire of loud calls and churrs or melodious bell-like notes and whistling. Typical song a loud jangling outburst repeating a few jerky staccato notes in regular pattern, with a clear strident note followed by nasal sound, the strophe starting and ending abruptly. Pairs perform duets; in SW India (Kerala; nominate race), one bird starts with sharp double rising note, answered with low-pitched whistle, and so on. Calls are long repetitive series of loud notes: in NE India (*grandis*), series of very short piping, rapidly repeated identical whistles, "vit-vit-vit"; in S India, resonant staccato, musical bell-like "clink, link, link"; in Kerala, call uttered fairly regularly after sunset and often in morning reported as "chooo-choóp, chooo-choóp, chooo-choóp"; in Borneo (*brachyphorus*), one creaky note followed by double fluty one, repeated twice at regular intervals, "crey-fulut". Able to mimic perfectly the calls or complete songs of wide variety of birds of different families: small raptors, koel (*Eudynamys*), Indian Cuckoo (*Cuculus micropterus*), woodpeckers (Picidae), hornbills (Bucerotidae), pitas (Pittidae), babblers (Timaliidae), thrushes (Turdidae), Old World orioles (Oriolidae), magpie-robin (*Copsychus*), even an introduced laughingthrush (*Garrulax*) in a Singapore parkland, the imitation produced promptly after original call and repeated after each; has been observed even to imitate perfectly the agitated behaviour of a Jungle Babbler (*Turdoides striata*); in captivity, may imitate song of a canary (*Serinus*), mewing of a cat, or two or three lines of a whistled song. In flight, long tail feathers produce characteristic humming noise, audible from long distance.

Habitat. Generally in humid broadleaf evergreen or deciduous lowland forests, to 800 m in Malay Peninsula, 1000 m in Myanmar and Thailand, 1400 m in China and 1500 m in India, but reported in the low S plains in Nepal. Also peatswamp-forest and mangroves, bamboo-jungle and teak (*Tectona*) stands, neglected overgrown rubber (*Hevea*) plantations, tall secondary growth in villages or suburban surroundings, plantations, timbered gardens, and orchards and parklands. Occasionally, appears in wooded patches or tall isolated trees in cultivation areas or open country. In Sri Lanka, race *ceylonicus* is found in low-country dry zone and in drier parts of hills, to 700 m. In areas where distribution overlaps with that of *D. remifer*, the two species tend to avoid each other (e.g. in Thailand and Malay Peninsula); in India, however, the two have been reported as present in same mixed flock.

Food and Feeding. Primarily insectivorous; some small vertebrates also taken. Nectar, e.g. of *Bombax ceiba*, *B. insigne* and *Erythrina*, an important complementary item. Grasshoppers and locusts (Acrididae), butterflies and moths (Lepidoptera), beetles (Coleoptera) and termites (Isoptera) form large proportion of diet; bees (Apidae) seem particularly favoured by race *grandis*. Crepuscular habits, hunting far into dusk, as well as during daytime. Hunts mainly in middle stratum or interior canopy. Feeds almost entirely on the wing, swooping from elevated lookout post, to which it returns after catching prey. Tree-frogs and small lizard seized on ground; larvae picked from tree trunks and branches in agile swoops and carried away in claws. In Peninsular Malaysia, attracted to insects on fruiting banyans (*Ficus*), and occasionally took small figs. Often a participant in mixed-species foraging flocks, e.g. with White-bellied Tree-Pie (*Dendrocitta leucogastra*), woodpeckers, monarch-flycatchers (Monarchidae) and leafbirds (*Chloropsis*) in Kerala; seems to benefit from arthropods disturbed by other animals, e.g. foraging woodpeckers in a Malaysian lowland rainforest, or crab-eating macaques (e.g. *Macacus fascicularis*), arboreal squirrels (Sciuridae), malkohas (*Phaenicophaeus*) and leafbirds as they move along branches. When in mixed-species flocks, present species plays important role in its vocal alarm calls against aerial predators. In India, pairs sometimes reported as associating with *D. remifer*, foraging side by side in mixed-species parties. Kleptoparasitism on laughingthrushes, mainly by single individuals accompanying mixed flocks, reported in C Myanmar; attacks initiated from low perch (1–2 m above ground) and delivered at birds foraging on ground for large prey (grasshoppers).

Breeding. Season mainly Apr–Jun/Jul in N Indian Subcontinent, Mar–Apr in Kerala (SW India), Apr–May in Andaman Is and Mar–May in Sri Lanka; Feb–Jul in Peninsular Malaysia, but mostly May in Thailand and from Mar to mid-Jun (even to Aug) in Myanmar; nest-building May in China; eggs Dec–May in Sumatra; breeding recorded Sept in Java. Apparently pairs for life. Seems to be attached to territory throughout year (in Kerala, c. 250 ha of well-wooded country); especially aggressive during nesting, when mobs and attacks large raptors, Great Hornbill (*Buceros bicornis*), other birds e.g. Large Frogmouth (*Batrachostomus auritus*) and even humans. Leaf-picking behaviour during courtship described. Nest built by both sexes, a small cradle of fine twigs, rootlets, grass stems or other vegetable fibres (e.g. broken leaves, moss or lichen), often so coarsely and thinly bound together with cobwebs that contents visible from below (nest of race *grandis* said to be "more or less like a transparent net"), for race *rangoonensis* external diameter 15 cm, depth 7·5 cm, interior dimensions 10 × 5 cm; hung in fork of horizontal branch, far from trunk and generally 5–15 m above ground, sometimes at 1·5 m (*grandis*), 2 m (*otiosus*) or up to 20 m (*ceylonicus*) or more (*rangoonensis*); in some areas, bases of leaf stalks of *Borassus* palm used as nest-site; nest tree in open bamboo-jungle, often a pinkado tree (*Xylia dolabriformis*), or in open meadow-like country, tea plantation, or on edge of road or rice paddy, very often a mango tree (*Mangifera indica*) in garden or outskirts of village, or rubber tree in Malaysia, and in Andamans race *otiosus* reported as nesting generally high up on more or less inaccessible branches of big tree, either in dense high forest or in very open forest; nesting sites used continuously over many years. Clutch usually 3 eggs, sometimes 4, but only 2 or 3 in S Myanmar (nominate race), ground colour white (rarely), pale pinkish-salmon or cream to warm pinkish-terracotta (the last not rare in N races), with large dark reddish to red-brown and purple blotches (more numerous at larger end) with secondary marking in pale grey or pinkish-grey, the same variety in all races; average size 27·8 × 20·2 mm (nominate), 27·6 x 20·3 mm (*rangoonensis*), 30·4 × 21·6 mm (*grandis*), 26·6 × 20·7 mm (*ceylonicus*); incubation of eggs and tending of chicks by both sexes, no information on duration of incubation and nestling periods; in Kerala, fledglings accompany parents closely and are fed by them with decreasing frequency and regularity for c. 5 months, although able to find food independently after less than 3 months, family bond apparently maintained until mid-Dec and young disperse by middle of Feb. Brood parasitism by Indian Cuckoo (*Cuculus micropterus*) reported.

Movements. Mainly resident; only a summer visitor in SW Yunnan (China). Vagrant in Uttar Pradesh (N India).

Status and Conservation. Not globally threatened. Regular and common in main parts of range; rare on Hainan. Found in many protected areas, e.g. Kazranga National Park (Assam), Peechi and Anamalai Wildlife Sanctuaries (S India), Khao Yai National Park (Thailand), Taman Negara National Park and Pasoh Forest Reserve (Peninsular Malaysia), Danum Valley Conservation area (N Borneo); on Hainan, endemic race *johni* is present in large mountainous Hainan EBA (13,000 km²), which is subject to severe natural habitat loss. Insular races which are well distributed and adaptable to man-modified habitats (e.g. *ceylonicus* in dry zone of Sri Lanka, where an important network of protected areas) seem not to be at any great risk. In contrast, races occurring only on small islands are directly threatened, as they have small populations in often largely disturbed habitat. Races *otiosus* and *nicobariensis* found only on, respectively, Andaman Is (6400 km²) and Nicobar Is (1800 km²); recent rapid settlement of these islands by people from Indian mainland (increasing agriculture and grazing, logging, coconut plantation), and proposal to create a free port and other facilities for international shipping on Great Nicobar (despite latter's status as Biosphere Reserve), place severe pressure on remaining natural forests and represent serious threats for endemic birds; few small protected areas in Andamans, e.g. Mt Harriet and Saddle Peak National Parks (covering 213 km²) and two new national parks (covering 536 km² of primary forest) in Nicobars. Race *microlophus*, present in N Natuna Is (covering 1750 km²) and other very small S China Sea island groups, appears threatened by loss of forest habitat, e.g. the large Pulau Natuna Forest IBA is unprotected.

Bibliography. Ali (1969), Ali & Ripley (1987a), Bucknill & Chasen (1990), Chen Fuguan *et al.* (1998), Eve & Guigue (1935), Goodale & Kotagama (2005), Grimmett *et al.* (1995), Ho Hua Chew (1988), Hoogerwerf (1965b), Hume & Oates (1889), King & Rappole (2001), MacKinnon (1988), MacKinnon & Phillipps (2000), van Marle & Voous (1988), Mayr & Vaurie (1948), McCarthy (2006), Medway & Wells (1976), Nash & Nash (1985a, 1985b), Neelakantan (1972), Robson (2000), Satischandra *et al.* (2007), Smythies (1986), Smythies & Cranbrook (1981), Stattersfield *et al.* (1998), Stuart Baker (1933), Styring & Ickes (2001), Vaurie (1949), Viswanathan (2008), Wells (2007), Yan Chongwei & Xu Weishu (1996).

6. Sri Lanka Crested Drongo

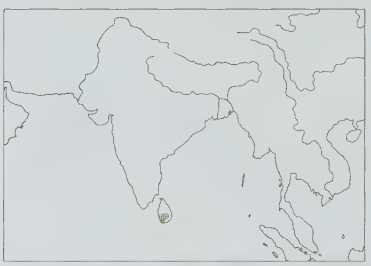
Dicrurus lophorinus

French: Drongo drongup **German**: Regendrongo **Spanish**: Drongo Cingalés
Other common names: Ceylon Black-crested Drongo, Ceylon Crested (Black) Drongo

Taxonomy. *Dicrurus lophorinus* Vieillot, 1817, Sri Lanka.

Has in the past been placed in monospecific *Dissemurulus*, or in *Dissemuroides*. May form a superspecies with *D. paradiseus*; often treated as conspecific, but differs in tail morphology and probably in voice. Molecular-genetic studies required in order to elucidate taxonomic status. Few intergrades with race *ceylonicus* of *D. paradiseus* formerly reported along border between wet and dry zones, but interbreeding not now possible, since suitable habitat no longer remains between the two ecological zones, now completely separated. Monotypic.

Distribution. Wet zone of SW Sri Lanka: from R Deduru Oya (in N) S to R Walawe (in SW).



Descriptive notes. 31–34 cm, excluding tail; two adults 70 g. Black plumage has metallic blue or greenish-blue gloss, except on lower abdomen and flanks, and on spangled throat and upper breast; deep velvety black on forehead and frontal tuft, latter looking like a short, dense, rounded and stiff crest, longest feathers of which curve over forehead; axillaries and underwing-coverts tipped white; long tail (161–200 mm) deeply forked (50–75 mm), outer feathers with complete webs strongly curved upwards and inwards; iris dull brownish-red or brown; bill neatly hooked, black; legs black. Sexes alike. Juvenile is less glossy than adult, greyer on abdomen, with smaller crest, and larger white tips on axillaries and underwing-coverts. Voice. Very noisy, with large repertoire of metallic calls and rich melodious notes and whistles, including mimicry of other birds, e.g. mynas (Sturnidae). Song an explosive mixture of whistles, bell-like, fluty or sweet grinding notes and harsh scoldings, including short strophes (sometimes preceded by thin and very soft nasal "nyit") of rapidly alternating jangling, clear, silvery and musical notes or repeated soft nasal chatters reminiscent of sounds made by a bulbul (Pycnonotidae); harsh churring notes may alternate with soft ones, whereas other song types have few or no harsh clanging notes. Song possibly distinct from that of race *ceylonicus* of *D. paradiseus* in being higher-pitched, less raucous and less sibilant, at times less repetitive and more irregular in pattern. Calls include nasal and mechanical "urdle-eee" or quick "urd-lee", and succession of loud disyllabic or single twanging notes.

Habitat. Tall, dense humid forests with ample undergrowth; common in lowlands and lower hills at 300–1200 m, but reported to 1700 m (Adam's Peak).

Food and Feeding. Insects. Hawks insects in air, swooping down on them, often from perch on high looping liana. Very sociable; several pairs often forage together and with other forest birds.

Breeding. Season Mar–May, mostly Apr. Nest a flimsy cup or shallow cradle made of roughly bound grass, roots or other vegetable fibres, rather small for the size of the bird, built mostly c. 6–7·5 m above ground in tall tree, generally at fork on outside of tree but recorded also among leaves near trunk, usually inside forest but perhaps sometimes at border of field; very like nest of race *ceylonicus* of *D. paradiseus*, but looking more untidy and not so well bound together with coweb. Clutch 2–4 eggs, generally 3, almost white (rare) to pale salmon-pink, often with tint of lilac or mauve, blotched and spotted reddish-brown with secondary markings of pale lavender, usually sparingly distributed over whole surface but rather more numerous on larger end, average 27·8 × 20·1 mm; very similar to eggs of race *ceylonicus* of *D. paradiseus*, but appear more heavily marked. No other information.

Movements. Resident.

Status and Conservation. Not assessed. Until recently treated as race of *D. paradiseus*; probably not globally threatened, but should be considered a Restricted-range species, present in SW part of Sri Lanka EBA. Over the past 40 years, Sri Lanka has suffered rapid deforestation as a result of expanding human population, leading to increased gathering of wood for fuel, and clearance for permanent agriculture, rubber (*Hevea*) plantations and settlements. Only 4·6% of original closed-canopy forest still preserved, but four important protected areas include largest remnants of lowland and montane rainforest in Sri Lanka's wet zone: Sinharaja National Heritage Wilderness Area, Peak Wilderness Sanctuary, Horton Plains National Park and Hakgala Strict Nature Reserve, totalling 320 km². Monitoring of the abundance and range of this species appears essential in order to rectify the current complete lack of information on its population, numbers and trend. Earlier reports of this taxon's presence in SW India (1933, Goa and Travancore) thought to be probably erroneous.

Bibliography. Ali (1969), Ali & Ripley (1987a), Anon. (2007a), Grimmett *et al.* (1995), Henry (1971), Rasmussen & Anderton (2005a, 2005b), Ripley (1981), Saha & Mukherjee (1981), Stattersfield *et al.* (1998), Stuart Baker (1924, 1933), Tweeddale (1878), Vaurie (1949).

7. Crow-billed Drongo

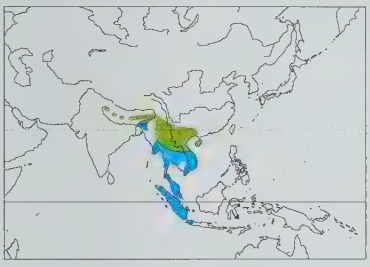
Dicrurus annectans

French: Drongo à gros bec **German**: Krähendrongo **Spanish**: Drongo Picogordo

Taxonomy. *Bhuchanga annectans* Hodgson, 1836, Nepal.

Earlier theory that this is a relatively ancient form, with close resemblance to *D. macrocercus*, not supported by recent DNA studies, which suggest comparatively recent separation from *D. paradiseus*. Monotypic.

Distribution. Breeds NE Indian Subcontinent (Himalayan foothills E from Uttarakhand), N & C Myanmar, S China (Yunnan, Guangxi, Hainan), N Thailand and N & C Indochina. Non-breeding far NE India, Bangladesh, probably S China, and S SE Asia S to Sumatra and W Java.



Descriptive notes. 27–29 cm; 44–68 g. Stout drongo having thick bill with equal width and depth at nostril level, covered at base by dense short feathers (partially concealing nostrils); tail flared and shallowly forked, outer feathers curving slightly outwards. Frontal band, lores and ear-coverts are dull black, rest of head, most of body and wing-coverts black, glossed steel-blue (contrast between glossy edge parts and matt base of feathers on head, breast and upper back characteristic); upper flanks iron-grey, some of the underwing-coverts and axillaries spotted with white at tips; tail fairly long (116–133 mm) and forked (depth of fork 17–26 mm); iris blood-red; bill and legs black. Differs from very similar *D. macrocercus* in being more glossy (blue, rather than greenish), with shorter tail less deeply forked, and deeper bill. Sexes similar, male a little larger than female. Juvenile is uniformly brownish-black, iris hazel or deep brown; first-winter has white spotting on breast, belly and undertail-coverts, and less pronounced tail fork than adult. Voice. Songs include loud musical whistles and churrs; characteristic descending series of harp-like notes or upslurs; short metallic trills and low-pitched whistles. Duet by pair in Bhutan consists of one bird (presumably female) singing monotonous and continuous low-pitched rhythmic series of 4 notes, "tu-tugudu", while partner produces short song of 3–4 melodious high-pitched fluty notes (final note stressed and protracted), "wet-wet-wet teeer". In Thailand, a varied chatter includes mix of irregular dissonant notes, nasal whistles and very diverse grinding calls. Varied sweet, melodious and plaintive "fuweeeit" "fuweeeyu" calls mixed with harsh "sqrsh".

Habitat. For breeding prefers dense broadleaf evergreen forest, moist deciduous forest or edge of forest, occasionally more or less open country; from plains into foothills, to 800 m (occasionally higher) in India, preferentially in lowlands in Nepal, to 1450 m in Bhutan. On migration and in winter found in wooded habitat, including closed forest, tree plantations, wooded gardens, secondary growth, coastal shrubs, mangroves, in lowlands and hills to 1100 m; in Malay Peninsula, migrants recorded at up to 1200 m but winter visitors generally not above 600 m.

Food and Feeding. Feeds principally on insects, including ants (Formicidae) and termites (Isoptera). Still-hunts from shaded perch, capturing prey at ground level in open areas, in clearings and along forest paths. Takes aerial insects by sallying from hidden perch or, less often, by more prolonged hawking. Generally singly or in pairs; joins mixed-species groups foraging at large swarms of flying ants and termites.

Breeding. Apr–May, but to the end of Jun for some birds. Nest built by both sexes, in c. 5 days, a very small, shallow cup of grasses, rootlets and fibres, bound with cobweb, very strong and firmly fixed on supporting branch, average external diameter 12 cm, depth 5 cm, internal diameter 6–8 cm, depth c. 2–3 cm, placed 7–12 m above ground (exceptionally lower) and rather inaccessible in horizontal fork at end of tree branch, generally not far from edge of dense forest or by path. Clutch 3–4 eggs, mainly pale cream (occasionally pure white) or buff, more rarely warm salmon, streaked with red-brown or purple-brown, with underlying streaks of pale grey or lavender, markings more numerous and often more or less confluent at broad end (aberrant eggs reported, speckled or spotted), average size 26·3 × 19·4 mm; incubation by female; male remains nearby in calling distance, for defence of eggs and young; no information on duration of incubation and nestling periods.

Movements. Migratory. Spends non-breeding period in E Bangladesh and adjacent NE India, and from S Myanmar and S Thailand S through Malay Peninsula (mainly on coasts and small islands, rarer inland, uncommon S to Singapore) and islands to Sumatra (rare) and Java (occasional in W coastal forest and mangroves). Passage Sept–Nov, and from early Mar (Malaysia) to May, but some individuals may stay longer in winter range, or even fail to migrate, as observed on Pukhet I (S Thailand) in mid-Jun. Resident on Hainan. Data for S China and Indochina lacking or contradictory. Vagrant in N Borneo and W Philippines (Sulu Archipelago).

Status and Conservation. Not globally threatened. Uncommon and local throughout range; somewhat more common in Bhutan. Appears very dependent on natural forests for breeding, and could be adversely affected by man-induced habitat changes. Considered a common migrant and common winter visitor in Malay Peninsula in middle of 20th century; now given as locally "Near-threatened", almost "Vulnerable", in Peninsular Malaysia on account of mid-winter importance of decreasing closed-canopy lowland forest, the species being unable to thrive in tree plantations with little understorey.

Bibliography. Ali & Ripley (1987a), Chen Fuguan *et al.* (1998), Chong Lillian Tsin (1932), Dickinson *et al.* (1991), Glenister (1951), Grimmett *et al.* (1998), Harrison (1962), King *et al.* (1975), Medway & Wells (1976), Meyer de Schauensee (1984), Parkers (1960), Rasmussen & Anderton (2005a, 2005b), Strange (2000), Stuart Baker (1924, 1933), Vaurie (1949), Wells (2007), Wildash (1968).

8. Hair-crested Drongo

Dicrurus hottentottus

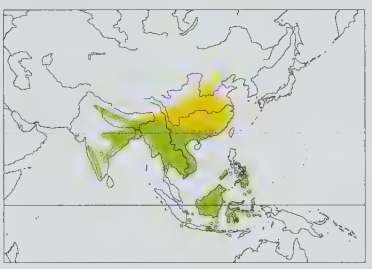
French: Drongo à crinière **German**: Haarbuschdrongo **Spanish**: Drongo Crestudo

Taxonomy. *Corvus hottentottus* Linnaeus, 1766, Cape of Good Hope; error = Chandernagor [Chandannagar], West Bengal, India.

Formerly considered conspecific with *D. menagei*, *D. sumatranus*, *D. densus* and *D. bracteatus*; DNA studies have indicated close taxonomic relationship of present species with *D. balicassius*, *D. bracteatus* and *D. megarhynchus*, and all of these, together with *D. montanus* and the aforementioned species, could be part of a superspecies containing eight species. Two Philippine races, *striatus* and *samarensis*, included within present species although having some similarity also to neighbouring *D. balicassius* (tail shallowly forked, outer rectrices flat, iris brown), are placed by some authors in *D. bracteatus* (despite absence of some specific characteristics of latter); inclusion within present species (or *D. bracteatus*) could be argued on basis of velvety black mantle (*D. balicassius* has whole upperside, including tail, very strongly glossed), but, on other hand, both races lack some other characters specific to present species (i.e. frontal hair-like filaments, large tail with end of outer feathers twisting inwards and outwards). Further taxonomic research essential in order to clarify true relationships among all of these species. Race *banggaiensis* sometimes synonymized with *pectoralis*, and in the past with *leucops*. Clinal decrease in size from N to S, birds in C India being similar to those of Myanmar and Thailand, intermediate between those of Himalayan foothills and those of S India (extreme length of male tail 149–164 mm in Himalayas, 132–155 mm in C India, 114–128 in SW India). Nominate race intergrades with *brevirostris* from S China (W Yunnan) and N Myanmar E to N Vietnam. Proposed race *chrishna* (described from Nepal foothills), allegedly larger than specimens from C & S India, is regarded as not distinguishable from nominate; *termeuleni* (Thousand Is, in Jakarta Bay, in W Java) considered inseparable from *jentincki*, but insufficient evidence available, and further study required. Race *banggaiensis* has sometimes been merged with *leucops* or *pectoralis*. Fourteen subspecies currently recognized.

Subspecies and Distribution.

D. h. hottentottus (Linnaeus, 1766) – peninsular India (Western Ghats; West Bengal and Orissa S through Eastern Ghats to N Tamil Nadu), and Himalayan foothills from E Punjab and Himachal Pradesh E to Bangladesh and NE India (Arunachal Pradesh, S Assam hills), N & C Myanmar (S to Tenasserim), N Thailand, S China (SE Xizang, W Yunnan), Cambodia, S Laos and S Vietnam.
D. h. brevirostris (Cabanis, 1851) – breeds C & S China (S from Shaanxi, S Shanxi and Jiangsu), N Myanmar, N Laos and N & C Vietnam; non-breeding throughout Indochina, Thailand and lower Myanmar.
D. h. palawanensis Tweeddale, 1878 – W Philippines (Palawan).
D. h. cuyensis (McGregor, 1903) – WC Philippines (Semirara, Cuyo).
D. h. samarensis Vaurie, 1947 – EC Philippines (Samar, Biliran, Leyte, Calicoan, Panaon, Bohol).
D. h. striatus Tweeddale, 1877 – S Philippines (Basilan, Mindanao, Nipa).
D. h. suluensis E. J. O. Hartert, 1902 – SW Sulu Archipelago (Tawitawi, Simunul and Sibutu), in SW Philippines, and Maratua I (off E Borneo).
D. h. borneensis (Sharpe, 1879) – Borneo.
D. h. leucops Wallace, 1865 – mainland Sulawesi and surrounding archipelagos to NE, SE & S; Matasiri I (in Java Sea).
D. h. banggaiensis Vaurie, 1952 – Banggai Is, off E Sulawesi.
D. h. pectoralis Wallace, 1863 – Sula Is (WC Moluccas).
D. h. guillemardi (Salvadori, 1890) – Obi (C Moluccas).
D. h. faberi Hoogerwerf, 1962 – Panaitan (Prinsen) I and islands in Jakarta Bay, in W Java.
D. h. jentincki (Vorderman, 1893) – E Java, Bali, and islands in Java Sea (Masalembu Besar and Kangean Is).



Descriptive notes. c. 32 cm (nominate), 28 cm (*brevirostris*), 25·5 cm (*borneensis*), 26–32 cm (*leucops*), 24 cm (*palawanensis*); four males 86–102 g and two 2 females 76 g and 90 g (India). Nominate race has long hair-like feathers (83 mm) springing from forehead, extending over hindcrown and upper back; plumage black, very brightly glossed metallic blue-green, with numerous breast spangles and broad and very large, long and glossy neck hackles, contrasting with velvety-black mantle; wing-coverts and rectrices brightly glossed, inclining to bronze-green; lores, frontal feathers and underparts velvety black, unglossed; distinctive tail nearly square-ended, inner four pairs of rectrices ending almost at same level as outer pair, latter a little longer, spiralling and twisted inwards and upwards; iris reddish-brown or dark brown; bill noticeably pointed and downcurved, not hooked at tip, dark grey to black; legs black. Female is like male, but duller, less velvety. Juvenile is browner and less glossed than adult, with shorter frontal filaments, shorter hackle feathers of breast and neck, and axillaries and underwing-coverts tipped with white. Race *brevirostris* is similar to nominate but has shorter bill slightly curved and with very small hook, tends to have proximal part of frontal filaments partially and finely barbed (rather than mostly bare), tail a little less forked, and gloss more green than blue (especially on rectrices); *faberi* is smaller than nominate (tail 115–127 mm), deeper black above and below, wings metallic green, iris creamy white; *jentincki* resembles previous, but tail longer (122–143 mm), plumage less deep black, metallic hue less intense and more greenish; *borneensis* looks blue in general colour, with strongly purplish-blue gloss, is smaller than preceding two (tail 110–117 mm), with large spangles and rather short frontal filaments (44 mm) always present, bill small and rather strong, iris scarlet to pale red-brown; *guillemardi* is large (tail 146–150 mm), plumage blue-black, has well-developed long, broad and very well-glossed neck hackles, short frontal feathers, hair-like filaments of medium length (average 46 mm) present in half of specimens, iris brown; *pectoralis* is like last but smaller (tail 120–133 mm), has longer, broader and more glossy hackles, brilliant metallic bluish-green wings, frontal filaments lacking in half of specimens, iris red; *banggaiensis* is bluish, similar to *guillemardi* but somewhat smaller, has frontal filaments present in smaller proportion of specimens, differs from previous race in being larger and in having brown (not red) iris; *leucops* is very similar to *guillemardi* but has white iris, frontal filaments shorter (10–36 mm) and present in smaller number of specimens, bill small, strong, barely hooked; *suluensis* has red iris, is similar in size and colour to *pectoralis*, but differs in more deeply forked tail and in having frontal filaments always present; *palawanensis* has red iris, but differs from *borneensis* in having four inner pairs of rectrices becoming gradually longer, tips of outermost with very slight tendency to curl upwards, no frontal filaments, general coloration brownish-black with gloss greenish (instead of bluish), hackles and breast spangles considerably fewer and smaller, some specimens larger (26·5–29 cm) than average; *cuyensis* is similar to previous, with gloss strongly greenish, but larger and glossier, the hackles and breast spangles large and abundant (as in *borneensis*), glossy reflections spreading irregularly from hindneck onto mantle, iris dark reddish-brown to dark brown; *samarensis* has tail very short, straight and square-ended, plumage greenish blue-black with brilliant gloss on wings and tail, velvety mantle, very short neck hackles, abundant and sharply defined spangles on throat and upper breast, no frontal filaments, but peculiar feathering at base of bill, iris dark reddish-brown to dark brown; *striatus* is like last, but tail a little longer and slightly forked. Voice. Especially noisy in breeding season. Very variable. Songs start with mostly loud, harsh, incisive "tchip" notes or jarring nasal buzzes, becoming melodious bell-like or jangling notes at different pitches and tempo; composition of strophes extremely varied, loud metallic notes including harsh chattering and scolding, raspy and screeching sounds, whining "beep" notes. Calls include typical disyllabic "tsit-weet", second note upslurred and mellower than first, repeated after short pause; in Borneo (*borneensis*), loud "tsit-wit" sometimes followed by lower "wuu"; other calls are loud hard incisive "tchip" in slow and irregular series, and subdued clanging notes constantly uttered; another type is a double "creaking gate" call; nominate race in India gives short repetitive series of 2 or 3 notes of different pitch, alternating with scratchy sound; mimics calls of many other bird species. Race *samarensis* (Bohol, in Philippines) seems to have much more melodious calls and song, with fluty and liquid whistled notes and few or no creaky sounds, given in rhythmic and repetitive fashion; *leucops* produces long, plaintive and melodious downslurred whistle. Has noisy flight.

Habitat. Essentially a forest-dweller. Inhabits mostly broadleaf evergreen and moist deciduous forest, secondary growth, thick scrub and small tree-jungle, and less often bamboo forest in India; bamboo-jungle and pine (*Pinus*) forest in China; monsoon forest on islands in E of range. Sometimes found in parks and gardens on migration. Occurs from lowlands to 1400 m in India, occasionally to 2000 m in Himalayas; below 1050 m in Nepal, 250–1850 m in Bhutan; up to 1000 m in hilly parts of China; below 1500 m in Philippines and 1700 m in Sulawesi; in Borneo, recorded

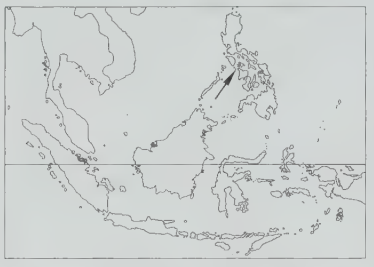
mainly at lower montane elevations to 1500 m in Kalimantan; occasionally recorded at c. 2400 m in SE Asia. In hilly forest areas of India, breeds nearly always near bottom of deep valleys. Prefers open parts of forest, clearings and forest edge; found also in lightly wooded areas in Vietnam.
Food and Feeding. Food mainly insects and nectar, in variable proportions. Large variety of insects captured, including hornets and wasps (Hymenoptera), ants (Formicidae), locusts and crickets (Orthoptera), cicadas (Cicadidae), beetles (Coleoptera, including scarabaeids) and other large prey. Nectar reported as important source of food in Indian Subcontinent, but insects possibly the primary target as flowers with thick sweet nectar, e.g. those of cotton tree (*Bombax ceiba*), attract myriads of insects, which easily caught by insectivorous birds. In E China, Borneo and Java, has been reported as feeding on emerging termites (Isoptera) and other ground insects, and on small lizards. Generally hawks insects from a perch, capturing them on the wing, often returning to same perch; sometimes follows monkeys or squirrels (Sciuridae) to catch insects disturbed by them. Forages also by searching leaves, tree trunks, and flowering forest trees in full bloom, using the long and tapered bill to reach into flowers, particularly kapok (*Ceiba pentandra*), *Butea monosperma*, *Chorisia speciosa*, *Delonix regia*, *Bombax*, *Erythrina indica*, *E. stricta*, *E. lithosperma*, *Acrocarpus*, introduced eucalypts (*Eucalyptus*) in India, and *Bombax ceiba* in Myanmar. In N Sulawesi, race *leucops* reported as taking insects from tree trunks in manner of a woodpecker (Picidae). Forehead and throat often coated with pollen, indicating that this species is promoter of cross-fertilization; reported as eating pollen in China. Forages singly and in small parties; occasionally gathers to mob predator or to feed in grove of flowering trees.
Breeding. Season poorly documented: Apr to late Jun in N Indian Subcontinent, Feb–Apr in S India, Apr–Jul in SE Asia (late Mar to May in Myanmar); laying May and early Jun and young fledglings in latter half of Jun in E China; nests with eggs found mid-Mar and mid-May in Borneo; birds in breeding condition Feb–May in Philippines; reported as single-brooded in Hong Kong. During breeding period, very noisy and very aggressive towards any cause of disturbance. Nest built by both sexes, seemingly taking equal parts, a deep saucer of grass, rootlets, tendrils of creepers, base so flimsy than contents usually visible from below, but structure strong enough to prevent young from falling through, varying in size from 20–23 cm in diameter externally and 10–11 cm internally (recorded in Nepal) to very small, c. 9 cm across (4 cm internally), and typical measurements in India c. 15–18 cm broad and 4–6 cm deep externally, and 9–10 cm broad and 3·8–4·4 cm deep internally; suspended in horizontal fork, usually at end of small branch, occasionally built at base of leaf fronds in crown of palm, on upper surface of bough, or (in China) slung on two or three sprays of bamboo near top of plant, and sited usually 5–8 m above ground, sometimes much higher or, conversely, lower (reachable by hand from ground), or sometimes placed in relatively small tree standing in open forest or mixed jungle of bamboo and trees, in India occasionally in jungle-covered ravine running through tea-growing land, in S Myanmar (Tenasserim) mainly at very end of thinnest branches of teak (*Tectona*), thingan (*Hopea odorata*) or other trees, in Assam several nests within short distance of large flowering cotton tree situated well inside forest; in study in mixed forest in China, height of nest above ground 2·2–14·2 m, length of branch 1·4–9 m, distance of nest from main branch 1–8 m (main factors in nest-site selection were short distance to mountain ridge, to water, to edge of wood or to trail, good presence of tall trees, low density of shrubs and herbage). Clutch 3–4 eggs, rarely 2 or 5, varying greatly in colour, from pure white to deep salmon (most commonly pale cream), and in markings, from being covered with longitudinal blotches of rather pale reddish-brown, lilac or purple-red, also sparsely with deep purple freckles (more numerous at larger end) to having pale red specks almost invisible and secondary markings absent or lavender-grey; average size (nominate race) 29·2 × 21·2 mm; incubation by female, rarely assisted by male, both sexes tend chicks, no information on duration of incubation and nestling periods.
Movements. Generally resident, except in N part of range. Most Chinese breeders (race *brevirostris*) migrate mainly to Indochina, Thailand and S Myanmar, wintering at higher altitudes than areas occupied by resident nominate race; occasional in winter in C China and regular in S China, small numbers wintering in Hong Kong, where a common summer visitor and passage migrant mid-Apr to mid-May and during late Sept, when individuals and small groups appear at sites where species not known to breed. In N India, S Himalayan range or S China, nominate race subject to seasonal movements depending on nectar supplies; vagrant in winter in W India (Kutch, in W Gujarat). Vagrants occasionally reported in e.g. SE Russia (S Ussuriland), Korea, Japan, Taiwan.
Status and Conservation. Not globally threatened. Fairly common in Nepal and Bhutan, locally common in Himalayan foothills in India, also in Bangladesh; uncommon in Indian peninsula in Western Ghats and Kerala, rarely reported in Tamil Nadu. Very common in summer in hilly parts of China, rare in lowlands; locally common in SE Asia (rare and local in Cambodia in 1950s). Common in forest areas of Philippines and Borneo; recorded in Kinabalu and Crocker Range Parks, in N Borneo. Quite common in lowland and secondary forests of Java, especially in drier E parts, and in Bali. Most of the island races may be considered as having restricted range and are mainly confined to Endemic Birds Areas (EBAs): *guillemardi* on small extreme S island of Northern Maluku EBA (total area 27,000 km²), *banggaiensis* and *pectoralis* on islands of Banggai and Sula Islands EBA (7200 km²), *suluensis* on Maratua I and in Sulu Archipelago EBA (1500 km²), *palawensis* in Palawan EBA (14,000 km²), *samarensis* on N islands of Mindanao and the Eastern Visayas EBA (120,000 km²), *striatus* on main island of latter EBA, and *leucops* in two EBAs (Sangihe and Sulawesi); races *cuyensis* (on Semirara, 55 km², and Cuyo, 130 km²) and *faberi* occur in other very small islands, but not linked to any EBA. All these mainly deforested islands are still subject to rapid degradation of this species' remaining natural habitat as a result of logging concessions (e.g. Sula, Mindanao) as much as illegal or domestic logging, massive human encroachment, industrial timber production, easy road access to protected areas (e.g. to Mount Apo National Park, on Mindanao, for construction of a geothermal power station), mine exploitation (coal on Semirara, gold in E Mindanao) and other human factors. Protected areas cover only a small part of some of these rainforest habitats, in Philippines e.g. a network of Environmentally Critical Areas is established on Palawan (the most deforested island in Philippines) and Rajah Sikatuna National Park on Bohol (race *samarensis* recorded). On Sulawesi, several protected areas under threat from illegal logging and mining include Lore Lindu Biosphere Reserve (race *leucops*), where research and eco-development programmes, as well as programmes to increase public awareness, have been set up.
Bibliography. Ali (1969, 1979), Ali & Ripley (1987a), Carey *et al.* (2001), Chalmers (1986), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1987), Dickinson *et al.* (1991), Fu Tungsheng (1937), Gao Zhenjian *et al.* (2006), Grimmett *et al.* (1995, 1998), Himmatsinhji (1964), Hoogerwerf (1949), Hume & Oates (1889), Kennedy *et al.* (2000), Koblik *et al.* (2006), La Touche (1925–1930), Li Jianqiang *et al.* (2009), McGregor (1909), Meyer de Schauensee (1984), Natarajan & Balasubramanian (1990), Onishi & Maki (2004), Mees (1982), Pandey, N.D. (1991), Parker (1963), Robson (2000), Shimba (2007), Smythies & Cranbrook (1981), Stattersfield *et al.* (1998), Stepanyan (2003), Strange (2001), Stresemann & Heinrich (1940b), Stuart Baker (1924, 1933), Vaurie (1949, 1955), Viney & Phillipps (1983), White & Bruce (1986), Whitten (1982), Wildash (1968).

9. Tablas Drongo

Dicrurus menagei

French: Drongo de Tablas **German**: Tablasdrongo **Spanish**: Drongo de Tablas

Taxonomy. *Chibia menagei* Bourns and Worcester, 1894, Badajos, Tablas Island, Philippines.
Has in the past been placed in a monospecific genus, *Dicrachibia*. Until recently was normally treated as conspecific with *D. hottentottus*; the two may form a superspecies with *D. montanus*, *D. sumatranus*, *D. densus*, *D. balicassius*, *D. bracteatus* and *D. megarhynchus*. Monotypic.
Distribution. Tablas I, in WC Philippines.



Descriptive notes. 35·5 cm. Distinctive drongo with very long (164–192 mm) and very deeply forked (70 mm) tail, elongated outer rectrices curving rather widely outwards and slightly upwards; when perched on branch, may remain in horizontal position, with tail hanging vertically down. General colour of plumage is dull black with purple tinge, velvety (rather than glossy); has small neck hackles, short scanty breast spangles; iris dark brown; bill and legs black. Differs from *D. hottentottus* mainly in tail shape and length. Sexes similar, female little smaller than male. Juvenile has brownish-black head and underparts, iridescent blue-black back and wings, tail splayed at end. Voice. Poorly known; seems not to be very vocal (unlike both *D. hottentottus* and *D. balicassius*), and vocalizations appear to be distinct from those of nearby race *palawanensis* of *D. hottentottus*. A typical call, lasting c. 1 second, a rasping sound like that of a cicada (Cicadidae), uttered irregularly at intervals of 2–10 seconds; another typical rasping, "dzak-tsee-ik", in duet occasionally answered with short "jieeh" call. Also "tsee-ik" call, sometimes accompanied by opening and closing of tail in scissor fashion. Appears not to act as flock sentinel.
Habitat. Relatively mature, closed-canopy forest; occasional records at edge of clearings, none in open areas. Recorded in mid-canopy of tall trees, often near stream.
Food and Feeding. Insectivorous. Hawks insects in air, also searches among leaves and on trunks; forages mostly in manner of *D. hottentottus*, but was never found to feed at flowering trees during recent observations. Small groups observed while foraging in vine tangles in manner of coucal (Cuculidae), searching for insects in dead leaves. Observed to hold dead leaf with one foot while hanging on to vine with other foot, and stripping out insects with its bill.
Breeding. Nest a small cup made of thin twigs and diverse vegetable fibres, coarsely woven, in form of three-quarters of a sphere (neatly deeper than typical drongo nest), suspended from slender branches among foliage in outer part of tall tree, high above stream. No other information available.
Movements. Resident.
Status and Conservation. Not assessed. Until recently treated as a race of *D. hottentottus*; probably globally threatened. Rare. Had apparently not been reported for many decades before observations in 1998–2002; in 1997, was considered probably already extinct. Believed to merit listing as Endangered or even Critically Endangered. Conservation concern justified by extreme degradation of forest habitat on an island of only 686 km². A "well-wooded" island at beginning of 20th century, Tablas is now almost completely devoted to agricultural activities and livestock-rearing, with rice fields in lowland areas and rough pasture or coconut (*Cocos nucifera*) plantations in hills; small-scale logging still a threat. A few forests remain, mainly in N, with largest areas around and between Mt Palaupau (585 m) and Mt Progreso (640 m), but remnants of original forest more than 10 m tall found only around summit and SE slopes of Mt Palaupau, and maintained as watershed protection for towns of San Agustin and Calatrava. Very few of the scattered forests officially registered cover more than 100 ha, and none in S seems to be mature. Additional surveys to estimate numbers and distribution of this species are required, as is protection of all of the remaining natural habitat on the island.
Bibliography. Allen (2006a, 2006b), Bourns & Worcester (1894), Collar (1997), Collar *et al.* (2001), Dickinson *et al.* (1991), Kennedy *et al.* (2000), duPont (1971), Vaurie (1949).

10. Sulawesi Drongo

Dicrurus montanus

French: Drongo des Célèbes **German**: Bergdrongo **Spanish**: Drongo de Célebes
Other common names: Celebes (Mountain) Drongo

Taxonomy. *Dicruropsis montana* Riley, 1919, Besoa, Taewo Mountains, north-central Sulawesi.
Formerly considered conspecific with *D. hottentottus*; the two may form a superspecies with *D. menagei*, *D. sumatranus*, *D. densus*, *D. balicassius*, *D. bracteatus* and *D. megarhynchus*. Differentiation of this small montane taxon may be the result of its retreat uphill in face of invasion by lowland race *leucops* of *D. hottentottus*, from which it differs completely; appears to be closely related to Halmahera race *atrocaeruleus* of *D. bracteatus* of neighbouring Moluccas, its possible origin. DNA studies required in order to clarify taxonomic position and relationships. Monotypic.
Distribution. Mountains of Sulawesi.



Descriptive notes. 25 cm; 38 g. General colour is strongly bluish-black with purple iridescence; mantle velvety black; short neck hackles, relatively small and narrow breast spangles; tail long (135–150 mm) and deeply forked (35 mm), tips of outer rectrices curving upwards; iris brown or dark brown-red; bill straight, black; legs black. Differs from similar *D. bracteatus* (of race *atrocaeruleus*) mainly in much smaller size; from *D. hottentottus* (of race *leucops*) in smaller size, especially smaller bill and feet, shorter, narrower and less glossy neck hackles and breast spangles, more deeply forked tail with tips of outer rectrices not curving so much. Sexes similar, female smaller than male but with longer tail. Juvenile apparently undescribed. Voice. Poorly known; duet songs include disyllabic or trisyllabic harsh grating "trrsh-trrsrh-trrrsh", answered with soft whistles e.g. low-pitched "twuu", or double descending "tee-twuu".
Habitat. Forest and woodland, from 550 m to 1800 m. Occasionally found in same localities as *D. hottentottus* (race *leucops*) in N peninsula, around limits of respective ranges, where the two are apparently reproductively isolated.
Food and Feeding. Insectivorous. Forages singly and in pairs; joins mixed-species flocks.
Breeding. No specific information available.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Sulawesi EBA. Uncommon to locally fairly common. Confined to Sulawesi, where widely distributed through-

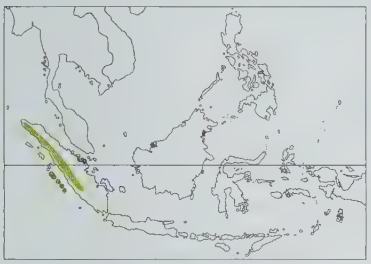
out most of the island. Population not evaluated, and no information available on a perceived decline; land clearance for settlements (mostly illegal) and sugar-cane plantation and unsustainable logging have led to deforestation, but principally in lowlands forests, particularly in S peninsula. In lowland rainforests ecoregion (500–1000 m; 116,000 km²), where 8% of area protected, illegal logging continues to be the biggest threat to integrity of remaining forests. In montane rainforests ecoregion (above 1000 m; 75,000 km²), situation appears relatively secure, principally in N & E, with 23% of area protected, e.g. Lore Lindu Biosphere Reserve, although extensive erosion on surrounding deforested slopes represents a threat, as do hunting and fires.
Bibliography. Anon. (2008i), Coates & Bishop (1997), Stattersfield *et al.* (1998), Stresemann & Heinrich (1940b), Vaurie (1949), White & Bruce (1986), Wikramanayake *et al.* (2001).

11. Sumatran Drongo

Dicrurus sumatranus

French: Drongo de Sumatra **German**: Sumatradrongo **Spanish**: Drongo de Sumatra

Taxonomy. *Dicrurus sumatranus* R. G. W. Ramsay, 1880, Ayer-Angat, Paio and Mount Sago, Sumatra.
Formerly considered conspecific with *D. hottentottus*; the two may form a superspecies with *D. menagei*, *D. montanus*, *D. densus*, *D. balicassius*, *D. bracteatus* and *D. megarhynchus*. DNA studies required in order to clarify taxonomic position and relationships. Two subspecies recognized.
Subspecies and Distribution.
D. s. sumatranus R. G. W. Ramsay, 1880 – highlands of Sumatra (Batak Highlands and Barisan Range, from Aceh S to Mt Kaba, in Bengkulu).
D. s. viridinitens (Salvadori, 1894) – Mentawai Is (Siberut, Sipura, N & S Pagai), off W Sumatra.



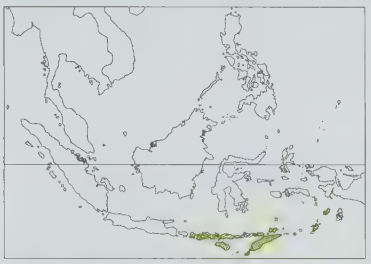
Descriptive notes. c. 29 cm. Distinctive drongo with tail nearly square-ended, outer rectrices straight or with very slight tendency to curve outwards; bill rather short. Male nominate race is black with deep ultramarine-blue gloss and purplish iridescence, mantle pure velvety black; small feathers at base of bill covering nearly two-thirds of length of bill; rictal bristles much exaggerated, projecting nearly as far as tip of bill; neck hackles narrow and well developed; tail 105–108 mm, depth of fork 7 mm; iris red; bill and legs black. Female is like male but smaller, although tail measurements similar to those of male. Juvenile undescribed. Race *viridinitens* is smaller than nominate, but with longer tail shallowly forked (average length 115 mm, depth of fork 9 mm), gloss strongly greenish, and lacks frontal filaments. Voice. Poorly known; includes melodious call of 3 whistled rapid notes, "tee-tiyeeah". One song a nasal disyllabic introduction followed by a series of 6–7 loud, clipped fluty trilled notes, final note separated.
Habitat. Submontane and lower montane dry primary forest or tall secondary forest, and forest edge, up to 800 m and possibly 1500 m, especially hill dipterocarp and lower montane forest; reported also at sea-level (e.g. Way Kambas National Park), but more abundant at middle altitudes. May occupy part of the niche normally filled by woodpeckers (Picidae) where latter absent or uncommon.
Food and Feeding. Insectivorous. Sallies from perch, hawks insects in air. Searches trunks and among leaves. On W islands (race *viridinitens*), small parties often seen to follow groups of primates, catching large insects disturbed by the mammals; frequently observed when perched, head up, on vertical trunk of tree (e.g. *Sterculia macrophylla* on Siberut I), tail pressed against bark in manner of woodpecker, and ascending in flitting hops to take ants (of genus *Iridomyrmex*); individual drongos can maintain this upright position for as long as 30 seconds. A fairly common member of mixed-species foraging flocks.
Breeding. Individual seen in early Apr while feeding two nestlings in tree beside river in lowland forest. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Sumatra and Peninsular Malaysia EBA. Fairly widespread, and locally relatively common. Nominate race fairly common at middle elevations within lower area of mountains; very common in Mamas Valley, in S Aceh. Race *viridinitens* frequent in all habitats, but restricted to a few small islands covering total of 6500 km²; W half of Siberut has been a national park (1900 km²) since 1993, but not well protected after new logging permit granted in 2001 for an area of 500 km², while remaining forest continues to be subject to large-scale logging activities. Nominate race may be adversely affected by habitat degradation and extensive loss of lowland forests to agriculture and logging; its apparent tolerance of secondary and logged forests, however, suggests only moderate decline. At end of 1990s, there were 20 protected areas in Barisan Range, the more important for montane-forest conservation being Gunung Leuser, Kerinci-Seblat and Bukit Barisan Selatan National Parks (constituting the Tropical Rainforest Heritage of Sumatra, c. 26,000 km²). This species' total population is undoubtedly smaller and its range more fragmented than in the past. More data on numbers and trends required.
Bibliography. Anon. (2008i), Butchart & Stattersfield (2004), Collar *et al.* (2001), van Marle & Voous (1988), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Vaurie (1949), White & Bruce (1986), Whitten (1982).

12. Wallacean Drongo

Dicrurus densus

French: Drongo de la Sonde **German**: Wallacedrongo **Spanish**: Drongo de Wallacea
Other common names: Greater Wallacean Drongo (*densus*)

Taxonomy. *Dicrourus* [sic] *densus* Bonaparte, 1850, Timor.
Formerly considered conspecific with *D. hottentottus*; the two may form a superspecies with *D. menagei*, *D. montanus*, *D. sumatranus*, *D. balicassius*, *D. bracteatus* and *D. megarhynchus*. Taxonomy of drongos inhabitating Lesser Sundas requires more detailed studies, both of molecular genetics and of vocalizations. Apparently no direct connection between race *megalornis* of present species and race *amboiensis* of *D. bracteatus*, despite extreme proximity of Gorong Is (occupied by former) to E tip of Seram, in SE Moluccas (occupied by latter). Supposedly smaller race *renschi* (described from Sumbawa) treated as synonym of *bimaensis*, type locality of which also Sumbawa. Six subspecies recognized.
Subspecies and Distribution.
D. d. vicinus Rensch, 1928 – Lombok, in W Lesser Sundas.
D. d. bimaensis Wallace, 1864 – Sumbawa, Komodo, Rinca, Flores, Pantar, Alor and Gunungapi.
D. d. sumbae Rensch, 1931 – Sumba.
D. d. densus Bonaparte, 1850 – Roti, Timor, Wetar and Sermata.
D. d. kuehni E. J. O. Hartert, 1901 – Tanimbar Is, in extreme E Lesser Sundas.
D. d. megalornis G. R. Gray, 1858 – Gorong I, Watubela Is and Kai Is, in SE Moluccas.



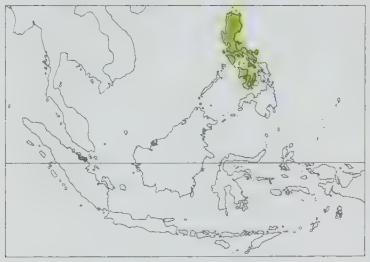
Descriptive notes. 28–38 cm, 30·5 cm and 33 cm (two nominate), 27·6 (three *biamensis*). Nominate race has general coloration dull blue-black with greenish gloss, except on mantle, which entirely dull; long neck hackles; feathers at base of bill well developed and extending forwards over culmen; tail long and deeply forked (male 173–181 mm, average depth of fork 49 mm), with tips slightly upcurved; bill thick, heavy and highly arched, ending in strong downward curve; iris red; bill and legs black. Sexes similar, male larger than female. Juvenile has iris dark brown, not red. Races differ mainly in size, in glossiness and in bill size, W races generally smaller, glossier, less green, and smaller-billed than E ones: *vicinus* has smaller wing than nominate, considerably shorter tail (118–127 mm) scarcely forked (6–17 mm), shorter bill more compressed and not so arched, feathers at base rather long and curling far forward over culmen and nostril, general colour bluer, a little glossier, mantle velvety, ends of outer rectrices curving up; *bimaensis* is similar to previous but smaller, tail short (120–127 mm) and even less forked (average 11 mm), tips of outer rectrices more upcurled, particularly in small birds of Sumbawa (tail of which very short, 105–108 mm), feathers at base of bill slightly longer and curling farther forward, plumage bluer, with more velvety mantle; *sumbae* also is smaller than nominate (but not so much as preceding race), tail 136–151 mm, about half as deeply forked (20 mm), bill shorter and less arched, feathers at bill base a little smaller and with less tendency to curve forwards, neck hackles long and narrow, gloss stronger and bluish, with metallic reflections extending to mantle; *kuehni* differs from nominate in having longer wing, but shorter tail less deeply forked (average male 26 mm, female 23 mm), glossy feathers of crown extend farther back, glossy reflections spread from neck onto mantle, bill more highly arched and a little less compressed; *megalornis* is clearly larger, male tail 168–183 mm, also slightly forked (25 mm), similar to last race but with no (or very few) metallic reflections on mantle, bill longer, still heavier and thicker, but less arched, female distinctly smaller than male. Voice. Poorly known. On Sumba (race *sumbae*) a song consists of rather short phrases of chopped percussive notes, twittery and liquid, starting with harsh rapid "churr"; on Flores (*bimaensis*) song includes continuous repetitive high-pitched musical and liquid twittering, curiously resembling that of small passerine such as a finch (Fringillidae) or a lark (Alaudidae); on Timor (nominate) a series of scratchy corvid-like calls alternating with very high or low-pitched grinding notes.
Habitat. Humid forest and various wooded habitats, from tall primary forest to mangroves and disturbed areas; also along roadsides with large trees or nearby plantations, or more open areas such as savanna and cultivation (race *sumbae*), and margins of semi-evergreen forest and secondary woodland (*kuehni*). Sea-level to montane forests; to 1650 m on Flores.
Food and Feeding. Insectivorous. Perches under canopy, sallying from horizontal branch to seize insects. Forages singly and in pairs; on Sumba, occasionally in groups of up to ten individuals in flowering trees. Often seen near troupes of crab-eating macaques (*Macaca fascicularis*) on Sumba. In Tanimbar Is, not observed to associate with mixed-species flocks.
Breeding. A few data from Flores: one nest c. 10 m above ground; eggs in Oct–Dec, pinkish-cream with light brown marking, or pure white and sparsely marked with small black spots and larger pale violet-grey blotches, average 29·4 × 20·8 mm. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Fairly common to common, and widespread. Some races confined to one or few islands of Lesser Sundas have restricted range, all of them included in Endemic Bird Areas (EBAs): nominate in Timor and Wetar EBA (34,000 km²); *sumbae* in Sumba EBA (11,000 km²); *vicinus*, on Lombok, and *bimaensis*, distributed from Sumbawa to Alor, both in Northern Nusa Tenggara EBA (39,000 km²); *kuehni*, in Tanimbar Is, in Banda Sea Islands EBA (7100 km²). All of these islands are subject to intense deforestation resulting mainly from shifting cultivation, grazing, burning, and gold-mining and copper-mining (Sumbawa). Total protected area is less than 10% of N chain of Lesser Sundas, and principally for important areas of montane forest, and this comprises Gunung Rinjani National Park (on Lombok), Tambora Selatan (on Sumbawa), Ruteng Nature Reserve (on Flores), Tuti Adagae Recreation Forest (on Alor). Only one reserve (Langgaliru Nature Reserve) protected on Sumba in 1998, and this island now covered in dry grassland and savanna woodland as a result of forest clearance and practice of burning. Monitoring of distribution and population trends is necessary for all of these insular forms.
Bibliography. Bishop & Brickle (1999), Coates & Bishop (1997), Linsley *et al.* (1999), Mees (2006), Stattersfield *et al.* (1998), Strange (2001), Vaurie (1949), White & Bruce (1986).

13. Balicassiao

Dicrurus balicassius

French: Drongo balicassio **German**: Philippinendrongo **Spanish**: Drongo Balicassio

Taxonomy. *Corvus balicassius* Linnaeus, 1766, Philippines.
Recent DNA studies indicate close relationship with *D. hottentottus*; both may be part of a superspecies that includes also *D. menagei*, *D. montanus*, *D. sumatranus*, *D. densus*, *D. bracteatus* and *D. megarhynchus*. Considered to be an early inhabitant of Philippine archipelago, not interbreeding with and well differentiated from representatives of related *D. hottentottus* present on W & S borders of its range. Nominate race intergrades with *abraensis* in NC Luzon (in region of Lingayen Gulf). Birds from Mindoro described as additional race, *mindorensis*, supposedly slightly larger and having metallic reflections of upper breast greenish-blue (instead of bluish-green), but comparison of specimens with a series of nominate allow complete integration in latter. Three subspecies recognized.
Subspecies and Distribution.
D. b. abraensis Vaurie, 1947 – N Philippines (N & C Luzon).
D. b. balicassius (Linnaeus, 1766) – N & C Philippines (C & S Luzon, Polillo, Lubang, Verde, Mindoro, Marinduque, Catanduanes).
D. b. mirabilis Walden & E. L. Layard, 1872 – WC Philippines (Ticao, Masbate, Panay, Guimaras, Negros, Bantayan, Cebu).



Descriptive notes. 26 cm; male 63·3–78·8 g, female 65–80 g. Frontal feathers and lores velvety black, otherwise whole of upperside black with strong metallic blue-green gloss, this extending over tail; feathers of crown, hindneck, throat and upper breast with gloss limited to tips and margins; feathers of side and back of neck lanceolate, forming short hackles. Nominate race has frontal feathers elongated and curved well forwards; belly black and glossy; flanks and rump silky-looking white or silvery grey (not normally visible), tips black and glossy; tail rather short (109·5–123 mm), shallowly forked (6·5–16·5 mm), outer rectrices flat and curving very slightly outwards; iris reddish dark brown; bill short and sharp, black; legs black. Sexes similar. Immature is similar to adult, but browner and less glossy. Race *abraensis* is duller than nominate otherwise rather similar, but a little larger, with heavier and larger bill, almost square-ended tail with average length greater for male (119 mm) than for female (114 mm) and depth of fork 4·2 mm, gloss more purplish, grey or white of flanks and rump more restricted, frontal feathers curved less far forwards; *mirabilis* is similar to nominate, except plumage from lower breast to undertail-coverts pure silky white in colour, flanks greyish, frontal feathers shorter, also slightly smaller than nominate but with longer bill, similar slightly forked tail (depth of fork male 7–15 mm, female 3–10 mm), male uncommonly slightly smaller than female (male wing 134–141 mm, female 135–143 mm; male tail 111–118·5 mm, female 109–122 mm). VOICE. Song a very pleasant mixture of clear whistled series interspersed with harsh notes and other sounds; on Luzon, nominate race recorded as singing in groups of 3–4 for long periods, as if engaged in competition, an extraordinary variety of repeated short phrases, including melodious whistles sometimes reminiscent of a turdid thrush or Old World warbler (Sylviidae), repeated nasal notes, chuckling and rolling sounds, plaintive calls, twangy or grinding notes (but no harsh squeaks, jumbles or grating tones). On Cebu, *mirabilis* produces very varied strophes of upslurred or downslurred warbling melodious whistles of contrasting tones, followed by succession of harsh sounds, including introductory "tchur-tchur-tcheeur", rapid cascade of 6–10 clipped "tcha-tcha-tcha-tcha-tcha-tcha", and final longer "tcheeur". Species often imitates other forest birds, e.g. Philippine Hawk-eagle (*Spizaetus philippensis*), Bar-bellied Cuckoo-shrike (*Coracina striata*), or other passerines.

Habitat. Subtropical or tropical moist lowland forest, to 1200 m. During study in Mt Isarog National Park (S Luzon), found to be common at 450 m, and noted only a few times at edge of forest near 900 m, but not at any higher elevation.

Food and Feeding. Few data. Catches insects and other prey by flying out from open perch, generally in understorey and canopy level. Often seen in pairs or small groups; very occasionally joins mixed-species flocks.

Breeding. Nest with eggs in Mar and birds with enlarged gonads Oct–Jul; probably breeds in all months of year. One nest found, an open globular cup, as deep as it was wide, made of brown rough plant fibres (stems and rootlets) with a little cobweb, 9 m above ground and coarsely wrapped around slender horizontal fork and a third larger branch; contained 3 eggs, visible through base of nest, and incubating adult (with head and tail overlapping cup) visible through roughly woven sides. No other information.

Movements. Resident.

Status and Conservation. Not globally threatened. Common. The three races are present in areas of major importance for biodiversity and conservation, especially *abraensis*, which is restricted to N part of Luzon EBA. Many islands within species' range are subject to rapid deforestation. On Luzon, the largest remaining primary lowland forest in Philippines (in Sierra Madre), reduced to only 6850 km² in 1990s (17% of the area forested in 1930s), is under logging concession; Mindoro, Negros and Panay almost completely deforested by 1988 (natural habitat remaining in, respectively, 8·5%, 4% and 8% of initial areas). Logging a primary threat throughout Philippines; other seriously adverse factors include growing of temperate or semi-temperate vegetables on bench terraces (in Cordillera Central, on Luzon), marble-mining and encroaching slash-and-burn cultivation (Mindoro), clearance of forest for subsistence agriculture, logging for domestic use (Negros and Panay), and spread of sugar plantations and urbanization (Cebu). Several protected areas cover main mountain ranges in Luzon, including foothills (e.g. Northern Sierra Madre, in N, Mt Makiling, in C, and Mt Isarog, in S), or only lowlands, e.g. Quezon National Park (at 300–420 m). On Cebu, one of the less forested islands of Philippines, race *mirabilis* has been recorded in Tabunan Forest, the last surviving fragment of forested habitat of Central Cebu National Park. On Negros, the protected status of Mount Canlaon National Park has not prevented total clearance of lower slopes.

Bibliography. Dickinson *et al.* (1991), Goodman & Gonzales (1990), Kennedy *et al.* (2000), McGregor (1909), Mearns (1909), Ocun (2006), Pasquet *et al.* (2007), duPont (1971), Stattersfield *et al.* (1998), Vaurie (1947, 1949).

14. **Spangled Drongo**

Dicrurus bracteatus

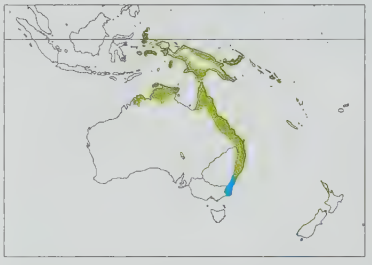
French: Drongo pailleté **German**: Glanzfleckdrongo **Spanish**: Drongo Escamoso

Taxonomy. *Dicrurus bracteatus* Gould, 1843, eastern and northern coasts of Australia.

Recent DNA studies indicate close relationship with *D. hottentottus*, with which formerly considered conspecific; both may be part of a superspecies that includes also *D. menagei*, *D. montanus*, *D. sumatranus*, *D. densus*, *D. balicassius* and *D. megarhynchus*. Some races, e.g. *buruensis* and *amboinensis*, which differ from others structurally and apparently also vocally, may represent separate species; further studies of vocalizations and DNA analysis required. Proposed island races *ultramontanus* (described from Aru Is) and, off SE New Guinea, *propinquus* (D'Entrecastaux Archipelago) and *dejectus* (Louisiade Archipelago) overlap so much in measurements and pattern with mainland *carbonarius* that all are synonymized with latter; likewise *manumeten* (described from Manusela, on Seram) is subsumed in *amboinensis*. Eleven subspecies currently recognized.

Subspecies and Distribution.

D. b. morotensis Vaurie, 1946 – Morotai, off N Halmahera (N Moluccas).
D. b. atrocaeruleus G. R. Gray, 1861 – Halmahera, Bacan, and West Papuan Is (Kofiau I).
D. b. buruensis E. J. O. Hartert, 1919 –Buru I, in SW Moluccas.
D. b. amboinensis G. R. Gray, 1861 – S Moluccas (Seram, Ambon, Haruku, Saparua).
D. b. carbonarius Bonaparte, 1850 – lowland New Guinea and satellite islands (including Boigu, Dauan and Saibai, in N Torres Strait), and Aru Is.
D. b. laemostictus P. L. Sclater, 1877 – S Bismarck Archipelago (Umboi and New Britain).
D. b. meeki Rothschild & E. J. O. Hartert, 1903 – S Solomon Is (Guadalcanal).
D. b. longirostris E. P. Ramsay, 1882 – S Solomon Is (San Cristobal).
D. b. baileyi Mathews, 1912 – NW Australia (N Kimberley Division, Bathurst I, Melville I, and N Arnhem Land).
D. b. atrabectus Schodde & Mason, 1999 – NE Australia (Cape York Peninsula and NE coast of Queensland S to Burdekin R); may migrate to Torres Strait and SC New Guinea.
D. bracteatus Gould, 1843 – coastal E Australia from Burdekin R area S in Queensland (inland to Great Divide) to NE New South Wales (rarely breeding S of 31° S); migrates to NE Australia, islands in Torres Strait and SC New Guinea.



Descriptive notes. Male 30–32 cm, average 88 g; female 28–30 cm, average 76 g; five *amboinensis* average 26·5 cm; *carbonarius* male average 84 g, female 79·5 g (both sexes average 72 g). Nominate race has whole plumage blackish, glossed with metallic green on crown, wing-coverts and outer webs of uppertail-coverts, contrasting velvety mantle; gloss on crown, throat and upper breast limited to tips and marginal ends of feathers, forming sharply defined oval or pointed spangles (gloss lacking on lores, forehead and rest of underparts); glossy feathers on side of neck elongated, forming lanceolate hackles; remiges brownish-black; underwing-coverts with white tips and iridescent greenish-blue edges; tail long (125–136 mm), moderately forked (average depth of fork 14 mm), with characteristic upward-turned tips; hefty and slightly hooked bill, numerous thick rictal bristles partly covering nostrils; iris bright red; legs and feet black. Sexes similar, male slightly larger than female. Juvenile is browner or dusky black and less glossy than adult, with undertail-coverts and belly feathers tipped white, giving spotted appearance, iris brown. Races vary mainly in size and in degree of gloss: *atrabectus* differs from nominate principally in being significantly smaller, with slightly narrower white tips on primary underwing-coverts, juvenile has more underparts feathers with white tips or fringes; *baileyi* is like nominate but slightly larger; *morotensis* has weaker and smaller bill, smaller wing, but longer tail (134 mm) more deeply forked (19 mm), outer rectrices less curved, is less glossy in dull blue, with rather short breast spangles and slightly longer neck hackles; *atrocaeruleus* is larger, with long wing, long tail (150–165 mm) rather moderately forked (16 mm), outer rectrices moderately curved outwards and upwards distally, long and heavy bill, frontal feathers well developed, rictal bristles long and strong, throat and breast with large spangles, general colour strongly bluish-black with purple iridescence; *amboinensis* is smaller than last, duller blue-black, with throat and breast spangles very much smaller, neck hackles poorly developed, shorter wing, shorter tail (135–141 mm) rather deeply forked (22 mm), bill rather long but strongly compressed laterally, with very weak rictal bristles, lacks curved frontal feathers; *buruensis* has long tail (163–174 mm) very deeply forked (42 mm), its length greater than that of wing, differs further from previous in having bill slightly more arched, larger, more numerous and glossier breast spangles, general colour purplish, and mantle invaded by a few metallic reflections (not dull or velvety); *carbonarius* is similar to *atrocaeruleus* but smaller in wing, tail (125–149 mm), depth of tail fork (17 mm), and bill, hackles shorter, white tips on underwing-coverts less prominent, longer bristles covering more of nasal groove than in nominate, purplish plumage with dark bluish iridescence, but variable (populations throughout New Guinea show variation in iridescence colour from purplish-blue to blue-green); *laemostictus* is similar to previous, but has deeper tail fork (21 mm), slightly longer bill, glossier plumage, metallic feathers of crown larger, spangles a little more numerous and larger, and hackles considerably longer and more brilliant; *meeki* has tail much less forked and not curving upwards at tip, metallic feathers of crown as large as previous race, throat and breast spangles fewer and small, rictal bristles more developed, longer and very strong; *longirostris* has longest bill of all races (29–33 mm), strongly compressed laterally, with short rictal bristles, lacking curved frontal feathers, and tail is flat, straight and scarcely forked (7 mm), iris brown to dark red. VOICE. Vocalizations of nominate race not well known, but adults reported as very noisy near nest or when feeding fledglings. During flight display, distinctive song of 5–6 single notes in series during descent and ceasing when bird is c. 3 m above ground, or a discordant jangle before display and during ascent, followed by torrent of rapid sharp twittering during descent; pairs reported as duetting or jangling in unison; alarm in presence of cuckoo (Cuculidae) or bird of prey a repetitive chatter of discordant and harsh sounds (often the first species to raise alarm), given also when chasing conspecific; sometimes 20 birds in chorus at dusk. Calls either melodious and whistling or grating and noisy, including harsh and grinding notes repeated for several minutes. Mimicry of many and varied other birds, including goshawk (*Accipiter*), Blue-faced Honeyeater (*Entomyzon cyanotis*), Little Wattlebird (*Anthochaera chrysoptera*), Noisy Miner (*Manorina melanocephala*), Pied Butcherbird (*Cracticus nigrogularis*) and Australian Magpie (*Cracticus tibicen*). Calls of Australian races wintering in New Guinea or occurring in S Torres Strait islands often resemble those of New Guinea race *carbonarius*. Vocalizations of latter mostly metallic-sounding, often high-pitched or squeaky, loud, ringing and conspicuous, varying greatly: shrill metallic upslur given singly or as 2 or 3 notes; 2-note disyllabic "kichew, kichew" repeated many times; double loud metallic upslurred shrill "tleei-tleei"; metallic call (0·5 seconds) consisting of harsh note followed by 2 ascending clear notes, repeated many times at intervals of 3–6 seconds; rapid "tutuchiew" or "tutuchiewtutuchie"; high-pitched "ping"; rapid trilled note followed by metallic slur, "prrrtiew"; peculiar pair of nasal notes, falling and then rising; harsh grating "kraaaa"; short, harsh, grating note followed by two pairs of squeaky falling and rising notes, "aaa-kuchi(-kuchi)"; harsh note followed by shrill, metallic disyllable, "tchaak-titiew"; slightly descending series of harsh, grating notes followed by 2 shrill metallic notes, "tchuck-tchuck-tchuck-tiew-teu"; slightly disyllabic nasal note with klaxon-like quality; low "phew-phew-phew" whistle sometimes given in flight. Short fluty calls resembling those of Old World oriole (*Oriolus*) or magpie-robin (*Copsychus*) recorded on Seram (race *amboinensis*), and long descending churr on Halmahera (*atrocaeruleus*). Race *laemostictus* rather quiet, calls lacking metallic clinking notes, some consisting of repetitive soft and short buzzes, others more scratchy and grinding sounds; on Buru (*buruensis*), one bird gave soft low whistles at long intervals, and when duetting longer rolling "rurrrrrru" calls and high-pitched trills answered by 3–4 slightly rising short whistles. Solomons races (*meeki* and *longirostris*) call less and more quietly, with varied chattering, piping and whistling notes.

Habitat. Large variety of tropical wooded habitats: rainforest, monsoon and gallery forests, mangroves, teak (*Tectona*) plantations, tall secondary forest, forest edge, also villages and sometimes suburban gardens. In Australia, occurs also in vine forests, in ecotone between rainforest or monsoon forest and open eucalypt (*Eucalyptus*) forest, and in wet or even dry sclerophyll woodlands or forests; regularly recorded in gardens and streets in some urban areas, more commonly near native vegetation, extending to temperate zone. Lowlands and hills, mainly to 600 m, locally to 1450 m in New Guinea; higher only in disturbed habitat, to 1600 m (New Britain) or 2000 m (Bacan).

Food and Feeding. Omnivorous; food mainly winged insects, but also caterpillars and teak moth (*Hyblaea*) pupae, and occasionally small vertebrates and fruits; diet also includes nectar (tongue has brush-like tip). Vertebrates taken include lizards, bats and, at least in Australia, small birds such

as Striated Pardalote (*Pardalotus striatus*); nectar taken from *Erythrina*, *Grevillea*, *Eucalyptus*. Has been recorded as predator of honeybees (*Apis mellifera*) in Australia, and taking wasps (Hymenoptera) from nest on walls of house; seen either to wipe bees against branch to remove sting or, returning to perch, carefully to transfer prey to feet, hold it against perch and peck off the sting. Perches upright on horizontal branch and sallies out to capture insects in flight, mostly from middle levels of forest up to canopy, often catching prey flushed by other birds, e.g. Rusty Pitohuis (*Pitohui ferrugineus*) in New Guinea and mainly Black-faced Cuckoo-shrikes (*Coracina novaehollandiae*) in Australia; forages also among foliage and branches, occasionally pouncing on to ground or trunk; catches insects emerging from ground at dusk. Congregates and forages in burnt areas, also at flowers of *Callistemon* in Australia. Steals prey from other birds in air; seen to target White-bellied (*Coracina papuensis*) and Black-faced Cuckoo-shrikes, Magpie-lark (*Grallina cyanoleuca*), Australasian Figbird (*Sphecotheres vieilloti*) and Willie Wagtail (*Rhipidura leucophrys*). Generally solitary, but pair-members sometimes associate loosely. Little information on association with mixed flocks. Reported in New Guinea as member of itinerant mixed-species foraging association, the "black and brown flocks" (distinctive in that member species converge on two alternative plumage colours, and that flock retains its character through many geographical and altitudinal changes of species composition); these include bird-of-paradise (Paradisaeidae), New Guinea Cuckoo-shrike (*Coracina melas*), and Tawny-breasted Honeyeater (*Xanthotis flaviventer*) associations, groups of species hierarchically led by New Guinea Babbler (*Pomatostomus isidorei*) or Rusty Pitohui, all medium-sized to large forest passerines that forage from understorey to lower canopy. In Australia, three or four individuals may join together in chasing small bats, but sometimes observed in mixed-species flocks, mainly with Black-faced Cuckoo-shrikes, occasionally with Yellow-eyed (*Coracina lineata*) or White-bellied Cuckoo-shrikes, mostly during non-breeding season; one flock with ten Black-faced and one White-bellied Cuckoo-shrikes and two individuals of present species reported as feeding on fruits. In New Guinea, observed to drink water from forest pool during dry season.

Breeding. In Australia season Sept to early May, occasionally from Jul, with laying mainly Oct–Jan (races *baileyi* and *atrabectus*) or Nov–Feb (nominate); Oct–Nov (*carbonarius*) in New Guinea area; nest with two eggs in mid-Dec in Moluccas (*atrocaeruleus*). Solitary pairs, but pairs sometimes close together, e.g. twelve active nests found each c. 45 m from nearest neighbour. Pre-breeding display described in Australia: one individual gave call and was joined by second bird, the two standing side by side, facing away from each other, calling, flicking tail and shaking wings, the first then turned to face the other, calling in unison, and turned again, while bobbing and bowing, this display repeated three times before the second individual flew to nest (c. 20 m away). Nest built by both sexes, taking 4–9 days (in Australia), a shallow cup of twigs, rootlets, stalks and tendrils of vine or fine grass, bound with spider web or other fine materials, lined with fine materials, firm but open enough for eggs to be seen from below, two nests had external diameter 15 cm, depth 7·6–10·2 cm, internal diameter 9–10 cm, depth 3·2–4·4 cm; slung in fork of horizontal branch, often of eucalypt in Australia, 4–18 m above ground, same site may be used for several consecutive years (up to eight recorded, but not known if by same individual birds); may nest in or near tree containing nest of other species, such as figbird (*Sphecotheres*) or Helmeted Friarbird (*Philemon buceroides*), or e.g. 5 m from nest of Leaden Flycatcher (*Myiagra rubecula*), once even close to tree with more than 150 Shining Starling (*Aplonis metallica*) nests and five figbird nests; estimated territory c. 3 ha in New Guinea (race *carbonarius*); parents attack any potential predator coming near nest. Clutch 2–5 eggs, often 5 or 3–4 (depending on region) in Australia and 2–3 in New Guinea area, ground colour ranging from pinkish-white, pale purplish-grey, purplish-white or pale creamy buff to almost white, with large patches of brownish brick-red and purple markings or small deep purplish, pinkish-red, lavender or chestnut dots, mostly at large end, average 29·8 × 20·7 mm (Australia), 28–31·5 × 21–23 mm (New Guinea area), one egg of race *atrocaeruleus* had "white ground upon which are distributed hairlines, blotches of secondary pale greys and lilacs, most in evidence at the larger end, with darker blotches and spots of liver-brown and sepia capping the larger end", 29·5 × 21·5 mm; incubation probably by both sexes, period c. 19 days; both also feed chicks, nestling period c. 3 weeks; fledglings accompanied by parents for up to 50 days. Nests parasitized by Common Koel (*Eudynamys scolopacea*) and Pallid Cuckoo (*Cuculus pallidus*).

Movements. Resident in New Guinea area (*carbonarius* and insular races) and generally in N Australia (*baileyi*); partly migratory in E Australia (nominate), some moving S of NE New South Wales (limit of breeding range) as far as Tasmania and even Kangaroo I, where very rare vagrant in May–Jul. Main E Australian population moves N after breeding, to N Queensland (Cape York Peninsula) and SE New Guinea (in Trans-Fly region), passing through Torres Strait from mid-Mar to end Apr, usually in small groups flying low over water, as well as up to 100 m; return S in flocks of up to 30 individuals in Oct–Nov. In New Guinea, an individual of nominate race not in full adult plumage seen in Dec suggests that some immatures may remain through year in non-breeding area; female in breeding condition recorded in Jan perhaps an indication that nominate may breed within range of *carbonarius*. Analysis of measurements shows that breeding populations of NE Queensland migrate N to New Guinea, and that populations breeding farthest S migrate as far as N Australia but do not cross Torres Strait, resulting in mix of small resident *atrabectus* and larger migrant nominate in Cape York Peninsula during winter. Migrates in daylight, from tree to tree or 25–40 m above forest, also 550 m offshore (50–100 m above water), and parallel to river (in Trans-Fly). In E Australia, apparent post-breeding altitudinal movements from E slopes of Great Divide towards coast reported.

Status and Conservation. Not globally threatened. Nominate race common; in SE Queensland, said to have increased in 1980s; formerly rare in Blue Mts (New South Wales) but now more common, frequency and occurrence increasing around Sydney in 1970s and 1980s, e.g. densities of up to 70–80 birds/100 ha in 1980s (compared with only 20 birds/100 ha in NE Queensland in same decade). Race *baileyi* confined to NW Australia EBA, especially in coastal mangroves and monsoon rainforest (density 70–80 birds/100 ha in Kakadu National Park, but only 3 birds/100 ha at S Alligator R); *atrabectus* occurs on Cape York Peninsula and in NE Queensland wet tropics, which hold some of the largest national parks in Australia, remaining lowland forests, covering a quarter of area, now partly protected. In breeding and non-breeding ranges in E & SE Australia, numbers said to have possibly increased. No known threats, except through capture by cats or mortality caused by flying against windows or lighthouses during migrations. Widely distributed race *carbonarius* common and ubiquitous in lowland forest in whole New Guinea; recorded in Lorentz National Park (West Papua), which subject to illegal logging, agricultural expansion and trade in rare species; in 1982, population in lowland rainforest study site near Port Moresby comprised 60 birds/100 ha. Races restricted to small islands may be at risk of rapid decrease or even extinction through severe deterioration of habitat; all occur in Endemic Bird Areas (EBAs). In Moluccas, two of the four races are subject to dramatic forest loss owing mainly to timber concessions, agricultural development and mining (gold on Bacan, nickel on Halmahera): *morotensis*, confined to Morotai I, and *atrocaeruleus*, on Halmahera and small surrounding islands of Northern Maluku EBA, which includes six protected areas, two of them (Lolabata, Ake Tajawi) covering more than 1000 km². Race *buruensis* is present in Buru EBA, where montane forest largely undisturbed in late 1990s, but now threatened by agriculture and logging; two protected areas exist, of which one (Gunung Kapalat Mada) covers 17% of the ecoregion. Race *amboinensis* is distributed on four islands of Seram EBA, still well forested except in coastal lowlands (at least until end of 1990s), but suffering from habitat loss caused by agriculture and timber activities, despite existence of seven protected areas (16% of the EBA), the most important being Manusela National Park. E of New Guinea, each of the three races is restricted to lowlands and hills of one or two relatively small islands, which have suffered and continue to suffer extensive loss and logging of lowland forest: *laemosticus* is widespread on New Britain (Bismarck), and in the Solomons *meeki* is uncommon on Guadalcanal and *longirostris* is common on San Cristobal. For all of these endemic populations regular survey of numbers and trends is required, with the aim of maintaining the great diversity of taxa in this region.

Bibliography. Beehler *et al.* (1986), van Bemmel (1947a), Blakers *et al.* (1984), Coates (1990), Coates & Bishop (1997), Diamond (1987b), Ford (1996), Hartert (1929), Higgins *et al.* (2006a), Parker (1963), Ramm (1998), Rand (1938b), Schodde & Mason (1999), Stattersfield *et al.* (1998), Strange (2001), Vaurie (1949), White & Bruce (1986), Wood (1996).

15. Ribbon-tailed Drongo

Dicrurus megarhynchus

French: Drongo de Nouvelle-Irlande **Spanish**: Drongo de Nueva Irlanda
German: Bandschwanzdrongo
Other common names: New Ireland Drongo

Taxonomy. *Edolius megarhynchus* Quoy and Gaimard, 1830, Dorey, New Guinea; error = Port Praslin, New Ireland, Bismarck Archipelago.

Recent DNA studies indicate that this species is most closely related to *D. bracteatus*, and also close to *D. hottentottus*; all may be part of a superspecies that includes also *D. menagei*, *D. montanus*, *D. sumatranus*, *D. densus* and *D. balicassius*. Differs from them principally in its very distinctive tail, but also in longer wings and larger bill. Monotypic.

Distribution. New Ireland, in Bismarck Archipelago.



Descriptive notes. 51–56 cm (up to 63 cm including elongated tail feathers); two birds 129 g, 130 g. Male is black to bluish-black, with strong blue-steel gloss on crown, wings and tail (except outermost tail feathers), neck with glossy blue streaks, upper breast sparsely spangled with glossy blue spots, underwing-coverts sparsely tipped with white; frontal feathers well developed and extending about half to two-thirds along culmen; outermost tail feathers enormously elongated (average length 384 mm) and fully webbed to the tips, extending 14–17 cm beyond rest of tail, distal third or quarter of shaft twisting spirally inwards (these feathers often broken, not fully grown or absent); iris orange-red or dark red; bill strong, black; legs black. Female is similar to male but smaller, with shorter tail-steamers. Juvenile undescribed. Voice. Very varied vocalizations, including high-pitched fluty notes, rapid upslurs, low-pitched soft disyllabic whistles given in slow and quiet succession; another remarkable repeated strophe consists of a rolling sound dropping into low-pitched deep twanging note. Calls include distinctive liquid whistle of several similar notes, and a whistled series, without harsh notes. Flares tail when calling. Voice different from that of *D. bracteatus*, even if some calls appear similar to those of New Guinea race *carbonarius* of latter.

Habitat. Primary lowland forest, hill forest, stunted mossy montane forest and tall secondary growth; sea-level to 1800 m.

Food and Feeding. Small invertebrates. Forages mainly in middle stage to canopy, but also, at higher elevations, in substage of mossy forest. Perches upright, tail dangling, on open perch within cover, from where it sallies for winged insects; also picks arthropods from surface of branches and leaves. Fairly shy and less noisy than *D. bracteatus*, and rather difficult to observe.

Breeding. No information available.

Movements. Resident.

Status and Conservation. Not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA. Fairly common to common. Global population trends not evaluated, but believed not to approach the level of population decline that would merit conservation concern. Nevertheless, natural forest is declining, threatened by logging or destruction for industrial plantations; this species, restricted to a small range (area of New Ireland is 8650 km²), could therefore become Near-threatened in the future.

Bibliography. Anon. (2008i), Beehler (1978a), Coates (1990), Mayr & Diamond (2001), Vaurie (1949).



PLATE 11

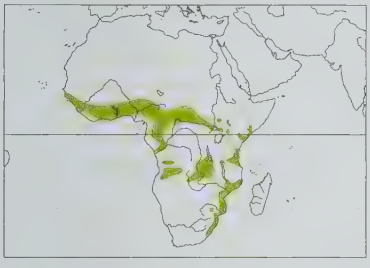
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16. Square-tailed Drongo

Dicrurus ludwigii

French: Drongo de Ludwig **German**: Geradschwanzdrongo **Spanish**: Drongo de Ludwig
Other common names: Sharpe's Drongo (*sharpei*)

Taxonomy. *Edolius ludwigii* A. Smith, 1834, Durban, South Africa.
Recent DNA studies indicate that closest relative is *D. atripennis*. Distinctive race *sharpei* may merit treatment as a separate species. Five subspecies recognized.
Subspecies and Distribution.
D. l. sharpei Oustalet, 1879 – S Senegal E to Nigeria, Cameroon, Central African Republic, S Sudan, Uganda and W Kenya, extending S to N Angola and N DRCongo.
D. l. muenzneri Reichenow, 1915 – S Somalia, E & SE Kenya, and E & S Tanzania.
D. l. saturnus Clancey, 1976 – Angola (W escarpment E to Moxico), SE DRCongo (Katanga) and Zambia.
D. l. tephrogaster Clancey, 1975 – S Malawi, E Zimbabwe, and Mozambique (N of R Limpopo).
D. l. ludwigii (A. Smith, 1834) – E South Africa, Swaziland and S Mozambique.



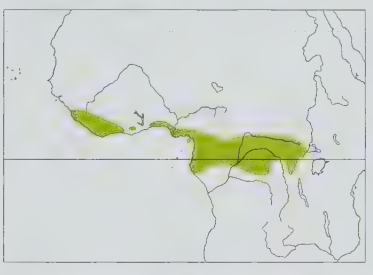
Descriptive notes. 18–19 cm; 25–35 g. The smallest African drongo, with slightly notched, almost square-cut tail (c. 85–95 mm). Male nominate race is entirely black, with uniform dark bluish-green gloss above and from breast to flanks and belly; flight-feathers uniformly blackish-brown; sometimes underwing and axillaries lightly marked with white feather tips that seem to persist on adults (not visible in field); iris pale orange to bright orange-red or blood-red; bill heavy and hooked, black; legs black. Differs from *D. atripennis*, which has similar tail, in significantly smaller size. Female is smaller and less glossy than male. Juvenile resembles female, but speckled pale greyish on mantle and breast, eyes brown; immature has pale tips on underwing-coverts and whitish fringes on belly and undertail-coverts. Races differ mainly in plumage colour or gloss, and tail length and shape: *muenzneri* is like nominate, but male has gloss below slightly more pronounced and more extensive, female underparts sooty black with blue-green across breast and white tips on axillaries and underwing-coverts; *tephrogaster* male is similar to previous, but less deep black, greener on crown and mantle, with rump, uppertail-coverts and underparts duller and greyer, wing shorter, female greyish on rump, uppertail-coverts and underparts; *saturnus* resembles nominate, but even less glossy, more greenish or bronzy; *sharpei* has bluish-violet gloss, black underparts, tail slightly less forked and feathers less lyre-shaped compared with other races, sexes similar. Voice. Very vocal, with extensive repertoire combining repeated disyllabic calls e.g. "tyip-tyip", single notes regularly repeated in varied tones and lengths, "toylu, toylu...", and phrases with explosive whistles and hard buzzy sounds. Includes upslurred repeated short notes or downslurred whistles and buzzes, e.g. "dzi-dzi-dzi-dzi-dwee", "zer-chi-hooey", or whistles only, e.g. "toypulee", "chi-chu-hooey", sometimes ending with loud "chop" ("tssyow" or "tssyoh" in Tanzania). Clear regional differences: in W Africa more muted calls compared with E birds, which have more "ringing" tone. In S Africa, song often introduced with low-pitched chatter, followed by loud whistles, "chu-wee-ju", "chop-suey" and nasal "dzi-dzaa-dzi-dzi" calls and trisyllabic twanging "tswing-tswing-tswing". Pairs perform quiet but rapidly delivered territorial duets combining short whistles and continued chattering of liquid notes like those of a bee-eater (*Merops*), including clicking sounds such as "tec-why-tyee" or "piu-took-why-tyee" from male, to which female gives harsh nasal reply (Gabon). Possibly imitates the brief call of African Goshawk (*Accipiter tachiro*) in flight.
Habitat. Wide variety of woodland habitats, with preference for edges, patches, glades, clearings and secondary growth. Present in gallery forest with dense undergrowth, wooded dense savanna in W Africa, mature and primary forest; follows riverine forests into cultivated areas and large degraded forest patches around villages. Associated with thick low forests in S Cameroon and Sudan. Sea-level to 1350 m in Cameroon, 1500 m in Mozambique, 1600 m in DRCongo and Zimbabwe; up to 2000 m in Tanzania and 2100 m in Sudan. In Kenya, *sharpei* present only above 1000 m in wet areas, whereas *muenzneri* present at lower altitude in riverine forests of semi-arid zones. Race *tephrogaster* reported in middle stratum of lowland and mid-altitude evergreen forest in Zimbabwe, *saturnus* in middle stratum of moist evergreen and riparian forest in Zambia, nominate in middle stratum and subcanopy of evergreen forests, rarely frequenting undergrowth. Clearly less of a forest-dweller than *D. atripennis*, which confined to primary forests where the two species meet, whereas present species tends to be more in fringes. In Gabon primary forest found almost exclusively in canopy and emerging trees, while *D. atripennis* occupies lower strata; but present also in lower strata (5–15 m) in secondary forests, where *D. adsimilis* occupies higher strata.
Food and Feeding. Insects, e.g. moths (Lepidoptera), locusts (Acrididae), mantises (Mantidae), beetles (Coleoptera), termites (Isoptera); in S Africa, reported as also taking nectar, and a potential stealer of food from other birds. Perches upright on bare branch, periodically twitching tail; darts out and seizes large insects in typical swooping flight, or snatches them from foliage; takes many termites during emergences of latter. Holds large items with the claws and uses bill to cut them into pieces. Lives in pairs or small family groups; joins mixed-species foraging parties, where it takes advantage of insects disturbed by other flock-members.
Breeding. Season roughly Feb–Jun N of equator and Sept–Apr in S, e.g. Nov–Apr in Gabon and Sept–Jan in S (peak Oct–Nov in Zimbabwe); laying Apr in Ghana, May in Liberia and Uganda, Sept in Zambia, Sept–Jan in Zimbabwe, Sept–Oct in Malawi, Oct–Apr in South Africa (KwaZulu-Natal), Nov (and fledglings Feb–Apr) in Gabon; fledglings late Mar in Togo and Apr–May in Nigeria. Monogamous; highly territorial, especially near nest, will attack and chase much larger birds, including raptors, but less noisy and aggressive than other forest drongos. Nest comparatively small for a drongo, external diameter c. 7·5 cm (interior cup 5–5·5 cm broad, c. 2·5 cm deep), made from large flakes of lichen, leaf petioles and dry plant stems, bound with cobweb, cobweb used also to secure nest to branches; attached in hammock fashion (looking like inverted low-crowned hat and held by the brim), usually at end of well-shaded, horizontal slender forked branch, either in outer branches of tall tree (at 25–35 m above ground in *Newtonia* in Zimbabwe) or in lower branches (2–8 m); destruction of nest after use or abandonment has been recorded, as has repeated use of material to build new nest; forest floor below nest covered with accumulated white droppings. Clutch 2 or 3 eggs, average 2·6 in South Africa and Malawi, plain white or pinkish-cream with faint lilac blotches and spots, or with zone of lavender-grey and tiny dark brown specks, mainly at larger end, c. 21 ×16 mm; incubation of eggs and rearing of brood by both parents, no information on duration of incubation and nestling periods.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common; rare or uncommon in some regions, such as Somalia (where largely confined to lower Jubba riverine forest), N & E of Gambia, N Ghana, and higher parts of its altitudinal range. Density in Gabon primary forest 7–8 pairs/100 ha. Thought not yet to have suffered any significant population decline. Even though the species uses cleared and secondary habitats, deforestation should be considered a potential threat. In S of range, destruction of coastal forest will result in fragmentation and contraction of range of nominate race.
Bibliography. Ash & Miskell (1998), Bannerman (1953), Barlow *et al.* (1997), Bates (1930), Brosset & Érard (1986), Cave & Macdonald (1955), Chapin (1954), Clancey (1976a), Elgood *et al.* (1994), Fry *et al.* (2000), Gatter (1997), Grimes (1987), Harrison *et al.* (1997), Hockey *et al.* (2005), Irwin (1981), Lewis & Pomeroy (1989), Manson (1983), Masterson (1990), Pasquet *et al.* (2007), Schouteden (1960), Scott (1983), Steyn (1996), Vaurie (1949), Vincent (1949), Walsh *et al.* (1990).

17. Shining Drongo

Dicrurus atripennis

French: Drongo de forêt **German**: Glanzdrongo **Spanish**: Drongo Selvático

Taxonomy. *Dicrurus atripennis* Swainson, 1837, Sierra Leone.
Recent DNA studies indicate that closest relative is *D. ludwigii*. Monotypic.
Distribution. Sierra Leone, SE Guinea, Liberia, S Ivory Coast and S Ghana E in forest to NE DRCongo, S to S Gabon and C PRCongo.



Descriptive notes. 21·5–24 cm; 35–47 g. The glossiest drongo in Africa. Male has head and body entirely black with strong characteristic shining steel-green to sometimes purplish-blue reflections, most pronounced on upperparts, throat and breast; forehead and lores velvety black, stiff feathers covering base of upper mandible; flight-feathers blackish-brown with shining outer edges of secondaries, wing-coverts and tertials black with some bluish gloss; tail slightly forked (length 89–111 mm, fork 5–15 mm); iris dark red (described as crimson in Gabon); bill and legs black. Differs from *D. ludwigii* in larger size, glossier plumage, larger tail with deeper fork. Female is similar to male but on average slightly smaller, with less gloss on throat and belly. Juvenile is sooty black, with some greenish gloss on wings and tail only. Voice. Lively and noisy. Territorial pair performs duets combining loud sharp notes, melodious whistles and harsh scratchy cries. Song sometimes introduced with brief chatter, and composed of single ringing notes grouped into few short phrases, repeated in very irregular rhythm, often finishing on single resounding note. Less twangy than that of *D. adsimilis*, with sequences of single or double notes rapidly and rhythmically repeated (4–13 times), including monotonous metallic whistles in changing tones (first sequence twanging, then more percussive, and so on), a steady "chyip-chyip" or a rapid succession of characteristic explosive ringing notes, "quick! quick! quick! quee! quirt!". Other vocalizations include double "pee-hee" whistles, double "jreeeep-jreeeep" screeches, buzzy "za-za-za" rattles, clicking sounds like "kli-tokli", "widdly-klock", "kewp-kewp" chuckles like those of *Turdus* thrush, liquid descending "chilly-poppa", and whistled and buzzy notes given in succession. Mimics calls of other birds, e.g. Red-billed Helmet-shrike (*Prionops caniceps*), Rufous Flycatcher-thrush (*Stizorhina fraseri*) and Bocage's Bush-shrike (*Chlorophoneus bocagei*).
Habitat. Restricted to primary forest and oldest secondary forest, from sea-level to lower hills; to at least 1000 m in Liberia. The most typical forest drongo, penetrating deeper into shady mature woodland stands. Occupies lower canopy and dense shrubs, usually between 5 m and 25 m, whereas *D. ludwigii* occupies higher canopy.
Food and Feeding. Mainly large insects (50–60 mm). In NE Gabon, observed to feed on Orthoptera, beetles (Coleoptera), moths (Lepidoptera), mantises (Mantidae), cicadas (Cicadidae), as well as flying termites (Isoptera). Stomach contents beetles, dragonflies (Odonata), cicadas, Orthoptera, spiders (Araneae) and millipedes (Diplopoda) in DRCongo; beetles, ants (Formicidae) and grasshoppers (Acrididae) in Liberia. Catches aerial prey (e.g. Lepidoptera) by sallying out from horizontal perch or a liana loop, usually below 20 m; other items taken by gleaning or hover-gleaning. Big items held with the claws and cut into pieces with bill. Follows swarms of carnivorous ants such as makokou (*Dorylus wilverthi*) for hours, sallying rapidly for disturbed insects in forest middle levels (5–20 m high) or plunging after falling prey; competes with and sometimes aggressive towards other large ant-followers, such as bulbuls (Pycnonotidae), hornbills (Bucerotidae) and small raptors. Lives in pairs and in family groups of up to five individuals, often associated with other species such as greenbuls (*Phyllastrephus*) and paradise-flycatchers (*Terpsiphone*). Conspicuous member of mixed-species foraging parties, following "searchers" and "beaters" from above foliage, and benefiting from insects disturbed by them. Indicates, together with Bates's Paradise-flycatcher (*Terpsiphone batesi*), approaching predators, by using powerful alarm calls and plunging into vegetation, prompting similar escape reactions from other birds.
Breeding. In Liberia more frequently reported Aug–Jan and displays and territorial behaviour Sept–Nov, but birds with enlarged gonads also in Mar and Jun; laying Aug–Dec in Liberia, May–Nov in Nigeria, Jan–Mar in Gabon, Aug–Sept in PRCongo; in DRCongo, May–Sept in N Ituri and Feb in Kivu. Lives as territorial pair; aggressive, chases other drongos and other bird species, including raptors and *Tockus* hornbills, and seen to harass African Harrier-hawk (*Polyboroides typus*) or even beating Crowned Hawk-eagle (*Stephanoaetus coronatus*). Nest a small shallow cup built from rootlets and lichens between twigs of horizontal forked branch, held with cobwebs and decorated with lichens, so simple and thin that contents visible through the structure; located 3–12 m above ground. Clutch 2 eggs (three clutches in Kivu, Gabon and Sierra Leone), and two chicks reported from nest in S Cameroon; egg creamy brown with irregular brown markings, average of

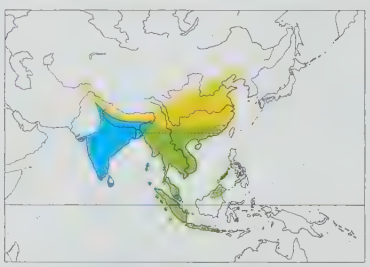
On following pages: 18. Ashy Drongo (*Dicrurus leucophaeus*); 19. White-bellied Drongo (*Dicrurus caerulescens*); 20. Comoro Drongo (*Dicrurus fuscipennis*); 21. Black Drongo (*Dicrurus macrocercus*); 22. Fork-tailed Drongo (*Dicrurus adsimilis*); 23. Velvet-mantled Drongo (*Dicrurus modestus*); 24. Mayotte Drongo (*Dicrurus waldenii*); 25 Madagascar Crested Drongo (*Dicrurus forficatus*); 26. Aldabra Drongo (*Dicrurus aldabranus*).

two eggs 24·6 × 17·3 mm; incubation possibly by both parents, both feed chicks, no information on duration of incubation and nestling periods.
Movements. Resident.
Status and Conservation. Not globally threatened. Widespread in African equatorial forests. Locally frequent in Liberia, Sierra Leone and S Ghana, very localized in S Ivory Coast; rare or uncommon in narrow coastal band in S Togo, S Benin and Nigeria. Locally common in S Cameroon, Equatorial Guinea, N & C PRCongo, extreme S Central African Republic, and N, C & E DRCongo. The commonest drongo in Gabon. Densities of 12–15 pairs/100 ha in Gabon primary forests, down to 6–8/100 ha in secondary stands; locally 10–20 pairs/100 ha in Liberia. Believed not to have suffered any significant population decline, although threats of large-scale deforestation exist, especially in Congo Basin.
Bibliography. Bannerman (1953), Bates (1930), Brosset & Érard (1986), Chapin (1954), Cheke & Walsh (1996), Colston & Curry-Lindahl (1986), Dowsett & Forbes-Watson (1993), Elgood *et al.* (1994), Fry *et al.* (2000), Gatter (1997), Pasquet *et al.* (2007), Schouteden (1960), Vaurie (1949), Willis (1983a).

18. **Ashy Drongo**
Dicrurus leucophaeus

French: Drongo cendré **German**: Graudrongo **Spanish**: Drongo Cenizo
Other common names: Pale/Grey Drongo; Indian Grey Drongo (*longicaudatus*); Assam Grey Drongo (*hopwoodi*); Burmese Grey Drongo (*nigrescens*); White-cheeked (Grey) Drongo (*leucogenis*)

Taxonomy. *Dicrurus leucophaeus* Vieillot, 1817, "Ceylon"; error = Java.
Recent DNA studies indicate that this Asian species is closest to the African group of drongos, providing evidence of a dispersal from Africa c. 10 million years ago. Dark race *longicaudatus* and white-faced race *leucogenis* formerly treated as two separate species. Subspecific taxonomy complicated, as many races not clearly differentiated and, in most of mainland, races are highly migratory. Race *hopwoodi* intergrades with *longicaudatus* in West Bengal and Bhutan, and with *mouhoti* in NE Myanmar, NW & W Laos and C Vietnam; *nigrescens* intergrades with *mouhoti* in S Myanmar and with *bondi* in SE Thailand; in China, pale race *leucogenis* intergrades with dark *salangensis* along R Yangtze, and latter may intergrade with *mouhoti* in N Vietnam (N Tonkin). Proposed race *beavani* (described from E Afghanistan) considered inseparable from *longicaudatus*; *celaenus* (from Simeulue, off NW Sumatra) and *palawanensis* (Palawan, in W Philippines) considered too poorly differentiated from nominate to warrant recognition. Fourteen subspecies recognized.
Subspecies and Distribution.
D. l. longicaudatus Jerdon, 1862 – breeds in S Himalayas from extreme E Afghanistan E to Bhutan; non-breeding at lower altitudes and through Indian peninsula (except Punjab, Sind and arid parts of Rajasthan and Gujarat) S to Sri Lanka.
D. l. hopwoodi Stuart Baker, 1918 – breeds in E Himalayas (E from Bhutan), SW & S China (from E Xizang E to S Guangdong), N & C Myanmar E to N Vietnam; migrates S to West Bengal, S Assam, Bangladesh, S China (Hainan) and S Myanmar, N & E Thailand and S Laos.
D. l. leucogenis (Walden, 1870) – E & C China from Liaoning S (E from N Gansu and Sichuan) to NE Guangdong; migrates to S China, N Laos, E Thailand, Cambodia, Tenasserim and Malay Peninsula (both W & E coastal plains).
D. l. salangensis Reichenow, 1882 – SE China S of R Yangtze (to Fujian–Guangdong border); migrates S to Hainan, S Indochina, E, C & S Thailand and Malay Peninsula.
D. l. innexus (Swinhoe, 1870) – Hainan.
D. l. mouhoti (Walden, 1870) – C, SW & E Myanmar, N & E Thailand and C Indochina; migrates to S Myanmar, S Thailand and Cambodia.
D. l. bondi Meyer de Schauensee, 1937 – W & E Thailand, Cambodia, S Laos and S Vietnam.
D. l. nigrescens Oates, 1889 – S Myanmar (Tenasserim) and Malay Peninsula (W of Main Range) S (including Phuket I and Pinang I) to Johor; post-breeding dispersal S to Singapore.
D. l. batakensis (Robinson & Kloss, 1919) – N Sumatra (Aceh and Batak Highlands).
D. l. phaedrus (Reichenow, 1904) – C & S Sumatra.
D. l. leucophaeus Vieillot, 1817 – Simeulue, off NW Sumatra; Java, Bali, Lombok; and SW Philippines (Busuanga, Culion, Palawan and Balabac).
D. l. siberu Chasen & Kloss, 1926 – Siberut, off W Sumatra.
D. l. periophthalmicus (Salvadori, 1894) – Sipura and Pagai Is, off W Sumatra.
D. l. stigmatops (Sharpe, 1879) – N Borneo.



Descriptive notes. 25·5–29 cm (nominate), 23–26 cm (*leucogenis*); 26–28 cm, 32–45 g (*longicaudatus*); 26–30 cm, 40–55 g (*hopwoodi*); one female c. 24 cm, 34 g (*salangensis*). Nominate race has plumage entirely ashy grey, rather dark on throat and underparts, with (as all races) velvety dark frontal band and blackish chin; tail long (122–136 mm) and deeply forked (28–41 mm), outer rectrices slightly flaring outwards and upwards; iris bright red; bill robust, black; legs black. Sexes similar in plumage, male slightly larger than female. Juvenile is browner than adult, with slight white fringing on belly to undertail-coverts, has wing and tail considerably shorter than adult, iris brown. Race *longicaudatus* has head, neck and wing quite black and glossy, back and tail very deep slaty blue-grey with unglossed greyish underparts, tail longer (156–170 mm) and more deeply forked (63–84 mm) than nominate, outer rectrices also turning outwards, small bill large at gape, slightly hooked at tip; *hopwoodi* is unglossed blue-grey, variable in colour and size, but always lighter above and below than preceding race, with tail shorter (138–170 mm) and less deeply forked (39–63 mm); *mouhoti* is smaller and paler than previous, blue-grey above and pale soft ashy grey below, rather similar to nominate but a little larger in all measurements, tail considerably longer (135–154 mm) and more deeply forked (41–56 mm), frontal band and lores grey-black, ear-coverts lighter grey; *bondi* is like last, but smaller and on average paler; *nigrescens* is dark slaty grey, like *longicaudatus* but paler and lighter grey below, distinctly smaller, tail shorter (146 mm) and less deeply forked (49 mm), frontal band and lores dusky black and ear-coverts grey; *leucogenis* is pale grey, below becoming whitish on vent and undertail-coverts, with blackish frontal band and chin, also sharply defined large pure white oval patch around eye, tail long (128–149 mm) and rather deeply forked, female less extensive white on face, immature darker and with less distinct white patches; *salangensis* is similar to previous but considerably darker, with pale facial patch less white and not so sharply defined, whitish edges and tips of underwing-coverts, immature slightly darker and with white patches still less distinct; *innexus* is intermediate between last and *mouhoti*, has lores and ear-coverts more or less whitish and poorly defined, underwing-coverts uniformly grey, tail intermediate in length and depth of fork, bill heavier and deeper than in all other races; *stigmatops* is similar to *mouhoti* in colour, but smaller in all measurements (tail 115–126 mm, depth of fork 28–34 mm), white of lores extending slightly around eyes, iris orange-red; *phaedrus* resembles previous in colour and size, but with smaller white loral spot extending occasionally below eye; *batakensis* is similar to previous but a little darker, with lores grey or with traces of whitish, very like nominate (except for occasional white on lores) but slightly lighter, with shorter tail (114–122 mm); *periophthalmicus* is pale blue-grey as nominate, but with large white facial patch; *siberu* is similar to last but slightly darker, especially on thin and throat, and smaller in all measurements, white facial area also smaller and not extending so far behind eye. Voice. Fairly pleasant and somewhat monotonous vocalizations; sometimes silent for long periods. Songs include rapid, jumbled, chattery phrases with straight and sweet notes alternating with twangy gruff ones. In Philippines, song of nominate race consists of slow succession of rising fluty whistles and *Oriolus*-like calls. In Nepal (*longicaudatus*) a very different song, a repeated series of 3 notes, one harsh and two fluty, "trshrr tee-twuu", with few variations; on non-breeding grounds in S India an irregular succession of soft, low and monotonous short notes. Usual call notes "drong-chip, drong-chip" and "chip-chop-drong", often at frequent intervals; also assortment of musical and harsh or scolding notes e.g. "cheece-cheece-chichuck" followed by whistling "kil-kil-kil-kil", or mewing calls. Another vocalization consists of loud, strident, clear downslurred whistles given regularly in twos or threes, with possible variation of a double quick lower note followed by a single one. Non-breeder in Singapore gave 2-note whistle, reminiscent of that of a leafbird (*Chloropsis*). Described as a good mimic of other birds, e.g. imitating piping whistles of iora (*Aegithina*).
Habitat. Essentially a forest bird, mainly in mountain areas, preferring more open forest; occurs in rainforest, mixed pine, oak and rhododendron (*Pinus–Quercus–Rhododendron*) forest, mixed bamboo-jungle. In Himalayas, breeds at up to 2500 m (Pakistan) or 3000 m (India), but mainly in foothills, at edges of clearings in coniferous forest or in broadleaf and mixed deciduous forests. In NW Myanmar (Chin Hills) race *hopwoodi* breeds in quite open grassland, as well as in well-wooded areas around villages and, more rarely, in forests. In China occurs generally at 600–2500 m, but to nearly 4000 m in Yunnan (*hopwoodi*), while *leucogenis* and *salangensis* are essentially birds of cultivated and highly wooded hill country. In Malay Peninsula inhabits mangroves, beach scrub, tree plantations, including rubber (*Hevea*), teak (*Tectona*) and edges of oil palm (*Elaeis guineensis*) stands, also forest edge, wooded parkland and large wooded gardens, all at plains level. Nominate race common in open woodlands and forest edge to 3000 m in Sunda Is (to 1300 m on Lombok), and fairly common resident in secondary growth, shrubs and trees in open and cultivated areas in Palawan group (Philippines). In Borneo, *stigmatops* common throughout mountains, but may be seen at low altitude in valleys; found also in mangroves, coastal scrub, secondary vegetation, forest edge on W coast plain. In Sumatra, occurs in forest areas, roadsides and town gardens, at 600–2400 m.
Food and Feeding. Principally insectivorous; some small vertebrates also taken. Consumer of nectar, among the most regular visitors at *Bombax* and *Erythrina* blossoms, as well as introduced *Grevillea* and eucalypt (*Eucalyptus*). Insects recorded as eaten include locusts, grasshoppers and crickets (Orthoptera), dragonflies (Odonata), stick-insects (Phasmida), moths and butterflies (Lepidoptera, including pierid *Aporia leucodyce* and papilionid *Teinopalpus imperialis* in Pakistan), mantises (Mantidae), also many smaller insects, i.e. termites (Isoptera), ants (Formicidae) and other Hymenoptera (including venomous ones), beetles (Coleoptera), flies (Diptera). Occasionally eats small lizards; occasionally small birds, e.g. Old World warblers (Sylviidae) and iora (*Aegithina*). Often seen perched high on open branch at edge of forest; sallies from treetop perch to take flying insects close to ground or on tree trunks and in canopy foliage. Follows cattle, riding on back of buffalo or sheep in manner of *D. macrocercus*, and captures insects disturbed by the mammal. Reported as robbing Hoopoes (*Upupa epops*) in Pakistan. Mainly crepuscular. Hunts singly, in pairs or in small noisy parties; sometimes gatherings of 30 or more individuals, especially when feeding on winged termites, which it snaps up in acrobatic flight. In India, a few individuals of present species were reported as associated with a larger group of *D. macrocercus* and Ashy Woodswallows (*Artamus fuscus*) feeding on fire-driven insects.
Breeding. Season May–Jun in Himalayas, chiefly Apr–Jun in China and Apr in C Myanmar; Mar–May in Sumatra area, and Jan–Aug (peak Apr) on S islands (nominate race); eggs laid in Jan and Feb in Borneo; normally single-brooded. Quite territorial; aggressive towards possible predators, such as Large-billed Crow (*Corvus macrorhynchos*), approaching nest at less than 60–70 m. Both sexes take part in building nest, female doing most of construction work, male bringing materials (in earlier stages, also occasionally placing them), work taking 5–10 days, a shallow flimsy cup of vegetable fibres, e.g. rootlets, grass stems, lichens, leaves, aerial roots of banyan (*Ficus*) or seeded flower tops (China), closely interwoven, and plastered with spider webs, and a few intermingled lichen or leaves, contents often visible through bottom of nest, external measurements 10–12 cm across and 4·5 cm high (*longicaudatus*), egg-chamber 7·6 × 3 cm (*longicaudatus*), 9 × 3 cm (*nigrescens*); usually high up (often 15–20 m), sometimes lower (reported from 3 m), suspended from or partly embedded (strongly attached) in fork at extremity of slender branch, often overhanging riverbank; in Malay Peninsula, found in outer branches of mangrove tree (including *Sonneratia*), garden tree or rubber tree (6–15 m); in India and Myanmar, reported in broadleaf and pine forest but also at base of leaf stalks in palm or against tall bamboo (supported on branch of twigs at a node); also in conspicuous place, such as leafless tree. Clutch 2–4 eggs, generally richly coloured dark salmon or terracotta with dark red-brown blotches and lavender grey undermarking (*longicaudatus*), also pale pink to pale orange with dark crimson blotches underlying lavender-grey or lilac-grey spots (*stigmatops*, *leucogenis*), or varying from pure white (rare) to pale yellowish-cream to deep salmon or rosy pink, or deep terracotta (*longicaudatus*), blotched with dark reddish-brown or purple and secondary markings of lavender, lilac or pinkish-grey (*hopwoodi*), 23·6 × 18·2 mm (*longicaudatus*), 24·6 × 18·5 mm (*hopwoodi*), 25·5 × 20 mm (*leucogenis*) and 29 × 20 mm (*stigmatops*); incubation by both sexes, period 13 days; both also tend chicks, no information on duration of nestling period. Nest reported as parasitized by Indian Cuckoo (*Cuculus micropterus*).
Movements. Migratory in N of range. Mainly resident in Indonesia, but roaming widely outside breeding season. Breeding summer visitor in Himalayas (*longicaudatus*), wintering in plains from E Punjab S to S India and Sri Lanka; conspicuous spring passage in Apr in foothills and plains of E Pakistan; locally resident in lowlands of Nepal. Birds from E Himalayas and S & SW China (*hopwoodi*) migrate S to Hainan and to plains through continental SE Asia, straggling to Andaman Is; those breeding NE & C China (*leucogenis*) migrate S along Chinese coast (passage regular in Taiwan and Hong Kong) to S China (Yunnan E to Hainan; regular winter visitor Hong Kong), regular in Malay Peninsula (along E and W coastal plains), rare migrant to Korea and Japan. C Chinese race (*salangensis*) moves S to Hainan, where it arrives late Sept (vagrant in Hong Kong and Taiwan), regular in peninsular Thailand and vagrant in S Malay Peninsula (S to Singapore). Migrants coming from somewhere near presumed *salangensis–mouhoti* contact zone recorded in Malay Peninsula and Andaman Is. In Singapore, *nigrescens* occurs during post-breeding dispersal.
Status and Conservation. Not globally threatened. Generally common throughout mainland range; race *nigrescens* nowhere common within its range, and vulnerable to loss of natural habitat. Nomi-

nate race, fairly common in Philippines and Lesser Sundas: Palawan and nearby islands subject to logging, mining and agriculture following large-scale human immigration, but a network of Environmentally Critical Areas recently established (e.g. recorded in St Paul Subterranean River National Park); parts of S Sundas under threat from forest clearance, burning and shifting cultivation. Both *periophthalmicus* and *siberu*, on small islands off W Sumatra, probably under threat from habitat depletion. Race *innexus* restricted to Hainan, and linked to the remaining montane forest composing the Hainan EBA (13,000 km²); *stigmatops* confined to Borneo, where present in Bornean Mountains EBA at 500–3700 m, e.g. recorded in Kinabalu Park; *phaedrus* and *batakensis* found in Sumatra, where human pressure strong against drongo habitat, mainly through use of pesticides in tree plantations, and destruction of wooded areas.

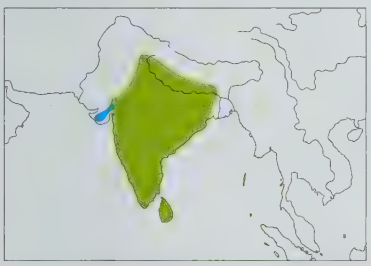
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19. White-bellied Drongo

Dicrurus caerulescens

French: Drongo à ventre blanc **German**: Graubrustdrongo **Spanish**: Drongo Ventriblanco
Other common names: Indian White-bellied Drongo (*caerulescens*); Ceylon White-bellied Drongo (*insularis*); White-vented Drongo (*leucopygialis*)

Taxonomy. *Lanius caerulescens* Linnaeus, 1758, Bengal, India.
May be related to *D. leucophaeus*. On mainland, nominate race exhibits decrease in size and reduction in extent of white on abdomen from N to S; overlap in individual measurements of wing and tail, however, is c. 50%, and more than that for bill, so that determination of geographical distinctions not possible. Sri Lanka races *insularis* and *leucopygialis* intergrade. Three subspecies recognized.
Subspecies and Distribution.
D. c. caerulescens (Linnaeus, 1758) – India S from Haryana and E Gujarat, E along lower slopes of Himalayas to S Nepal, and to West Bengal and C Orissa.
D. c. insularis (Sharpe, 1877) – N & SE Sri Lanka.
D. c. leucopygialis Blyth, 1846 – SW Sri Lanka.



Descriptive notes. c. 24 cm; 39–41 g. Nominate race has frontal band and lores black and unglossed, rest of head, throat and upper breast varying from smoky blue-grey to brownish-grey, white from lower breast and flanks to undertail-coverts (extent of white variable); upperparts blackish, dully glossed slate-grey to indigo; tail black, fairly long and slender (112–130 mm) with rather deep fork (27–39 mm), end of outer rectrices curving outwards; iris brownish-red; bill and legs black. Sexes similar in plumage, male a little larger than female. Juvenile is dark brown above, brown on throat and breast with less visible distinction from white belly, traces of white barring on breast, flanks, axillaries and underwing-coverts; first-winter similar, but with slate-grey gloss above. Races differ mainly in size, intensity of dark colour above and extent of white below: *insularis* is smaller than nominate (tail 104–117 mm, depth of fork 24–26 mm), with purer and more intense black on upperparts, heavier bill, abdomen duskier and more streaked, white area not extending to flanks and starting lower; *leucopygialis* is a little bigger than previous (tail 109–120 mm, fork 26–30 mm), also darker above than nominate, white below restricted to vent and undertail-coverts and contrasting with dark uniform grey abdomen. Voice. Songs resemble chatter of small passerines such as finches (Fringillidae) or thrushes (Turdidae); excellent mimic, imitating, among others, tailorbird (*Orthotomus*), Common Woodshrike (*Tephrodornis pondicerianus*) and iora (*Aegithina*), and even mewing of a cat (observed in Sri Lanka); said to have sweeter song than that of any other drongo, with notably less harsh notes than *D. macrocercus*. Calls of nominate race include short or long dry buzzes and variety of sweet, short whistles, e.g. "dee-dee", resembling that of Old World oriole (Oriolidae) or *Turdus* thrush. Race *leucopygialis* has highly varied and prolonged but choppy songs, composed of rather harsh staccato notes mixed with sweet, short and clear ones.
Habitat. Edges of paths and shady glades in dry and moist deciduous and bamboo forests, wooded compounds in inhabited rural areas, tea or rubber plantations; breeding reported to 2000 m along Himalayas, to 1500 m in S India. In Sri Lanka, race *insularis* occurs in wooded areas and gardens, avoiding forests, in low dry zone (flatlands with annual rainfall of c. 150 cm, principally during NE monsoon), up to c. 1500 m; *leucopygialis* is found in trees of wet lowlands and nearby hills in low wet zone (area of hills to 500 m, SW of C mountains, receiving well-distributed annual rainfall of up c. 500 cm); both races occur irregularly in C hill zone (consisting of mountains reaching 2300 m, and with annual rainfall exceeding 500 cm in some parts but much less in others).
Food and Feeding. Mostly insectivorous, feeding on winged insects such as crickets and grasshoppers (Orthoptera), moths (Lepidoptera), alate termites (Isoptera) and others; sometimes takes small birds, such as Old World warblers (Sylviidae). Also fond of nectar, of e.g. *Bombax*, *Erythrina*, playing an evident role in pollination; reported as only carnivorous in Sri Lanka. Usually perches upright on branch or treetop, from which it flies out, making short looping sallies, moving with agility, and snapping up prey in the bill or claws; returns again and again to same perch or one very near. Small birds caught with claws in mid-air. Occasionally pirates food from other birds, either in surprise attack or after dogged pursuit. Highly crepuscular. Occasional nocturnal feeding observed in India, as e.g. by birds perched on wire or tree bough around electric light bulbs in front of forest rest house. Hunts singly, less often in twos or threes; often joins mixed flocks, and associates with *D. aeneus*.
Breeding. Season Mar–Jun (mostly Mar–May) in most of range; in Sri Lanka, Feb–Jun (mostly Mar–Apr) in N & SE (*insularis*) and Mar–May in SW (*leucopygialis*). Territorial; may attack crows (Corvidae), hawks (Accipitridae) or other aerial predators to drive them away from neighbourhood of nest-site. Nest built by both sexes, that of nominate a comparatively large and rather bulky cup of roots, grasses and twigs, bound with cobwebs, placed 3–9 m above ground in fork of horizontal outer branch of small or medium-sized tree, e.g. oak (*Quercus*) in mixed open forest, teak (*Tectona*) and bamboo in hilly districts, *Alnus nepalensis*, *Acacia elata* or *Acer oblongum* in deep valleys; rubber tree (*Hevea*) favoured by race *leucopygialis*, nest of which rather small and shallow (internal diameter and depth 6 × 2·5 cm), well finished, generally decorated externally with scraps of bark, lichen or moss, lined with fine grass or tendrils of creepers, the whole structure strengthened with many cobwebs, often built high above ground, up to 12 m, betrayed by head and tail of sitting bird projecting on each side. Clutch of nominate race 2 or 3 eggs, sometimes 4, pale cream or yellowish-salmon to mostly warm salmon-pink (never white), spotted with blackish-purple or reddish-brown, average 23·6 × 17·8 mm; in Sri Lanka 2–4 eggs (mostly 3), very pale cream, salmon-pink or reddish white (rarely pure white) with large or small specks of brown, brownish-red or bluish-grey, most numerous at large end, average 22 × 17·1 mm (both races), 23·3 × 17·3 mm (*leucopygialis*); 3-egg clutches of *leucopygialis* occasionally contain one bigger egg, sometimes one smaller; incubation of eggs and tending of chicks by both sexes, no information on duration of incubation and nestling periods.
Movements. Resident; in India some seasonal local and altitudinal movements, e.g. non-breeding visitor in C Gujarat.
Status and Conservation. Not globally threatened. Widespread but generally uncommon in India; locally common in Nepal from lowlands to 300 m. Recorded in Nagarhole National Park, in S India. Reported as common in Sri Lanka, but deforestation for agriculture, tree plantation or settlements could lead to local decrease of the two races. Most of the protected areas in Sri Lanka are in the dry zone, e.g. Ruhunu and Horton Plains National Parks (covering c. 1010 km²), and *insularis* is therefore better protected than is *leucopygialis*. Latter race occurs in wet-zone tropical evergreen forest, more subject to destruction but with four important reserves, including largest remaining areas of lowland and montane rainforest: Sinharaja World Heritage Wilderness Area, Peak Wilderness Sanctuary, Horton Plains National Park and Hakgala Strict Nature Reserve (covering c. 350 km²).

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20. Comoro Drongo

Dicrurus fuscipennis

French: Drongo de Grande Comore **Spanish**: Drongo de la Gran Comora
German: Braunschwingendrongo
Other common names: Grand Comoro Drongo

Taxonomy. *Buchanga atra* var. *fuscipennis* A. Milne-Edwards and Oustalet, 1887, Grand Comoro (Njazidja), Comoro Islands.
DNA studies indicate that this species is well differentiated, and slightly older than its closest relatives, *D. adsimilis* and *D. modestus*, suggesting that it originates from colonization by an ancient African drongo of an island of the Comoro archipelago much older than Grand Comoro (possibly Mohéli) c. 5 million years ago. Drongos from neighbouring Indian Ocean islands, *D. waldenii* (Mayotte), *D. forficatus* (Madagascar and Anjouan) and *D. aldabranus* (Aldabra), form a distinct group that separated at about the same period. Proposal that all these, along with *D. macrocercus*, form a superspecies not supported by molecular-genetic studies. Monotypic.
Distribution. Grand Comoro (Njazidja), in Comoro Is.



Descriptive notes. 26·5–29 cm. Plumage is entirely deep lustrous black, with uniformly dark dull blue gloss (turning gradually bronze on wing-coverts), except for primaries and rectrices, which unglossy reddish-brown (much clearer on undertail); in flight, gives false impression of pale underwing patch, as underside of primaries reflects light; tail relatively long (116–136 mm; two males 124–131 mm, two females 117–119 mm) and shallowly forked (13–20 mm, two males 20 mm, two females 13–17 mm), with ends of rectrices straight; iris dark brown; bill slightly curved at tip, black; legs black. Sexes identical in plumage, male slightly larger than female except for similar bill length. Juvenile is matt blackish-brown to greyish. Voice. Varied repertoire with typical harsh drongo squeaks, sharp clicks, trills, fluty whistles and grinding sounds, characterized by softer "wit wit" notes. Compared with *D. waldenii* or *D. forficatus*, song appears less harsh, more nasal, higher-pitched, with variety of liquid and melodious strophes including sturnid-like downslurs, some of them possibly imitating mynas (Sturnidae) or other species. Also gives repetitive creaks, and reported as uttering "chlew" call like that of domestic chick before attacking a goshawk (*Accipiter*). Pairs perform duets during breeding season.
Habitat. Shows preference for forest clearings and degraded areas, such as plantations and agricultural fields with few high trees and a well-developed layer of bushes and low trees. Apparently requires tall trees and open airspace to allow aerial feeding. Recorded also in cacao plantations. Present mainly at lower edge of Mt Karthala forest, between 500 m and 1000 m; recorded also at lower elevations, almost to sea-level. This species' occupancy of mainly degraded vegetation with exotics suggests that native optimal habitat may have already disappeared at lower altitudes, and that it may now be restricted to marginal habitats.
Food and Feeding. Food includes large insects. Analysis of contents of four stomachs revealed consumption of beetles (Coleoptera), grasshoppers (Orthoptera), cockroaches (Blattodea) and mantids (Mantidae); also fruits, which were main element in one of them. Forages mostly on large flying insects in sunny places; perches relatively high in trees, generally in very visible position, and sallies out to seize prey on wing. Recorded as perching on shrubs in woodland canopy 10–20 m tall (near Kourani). Observed singly, in pairs, and in family groups of up to seven individuals. Very active in morning.
Breeding. Season Sept–Dec, possibly beyond; nest probably built in Sept–Oct, as eleven adults in Aug were not in breeding condition and two pairs found with nest by mid-Oct; nest with one-week-old chicks in Nov and fledglings observed in Dec. Territorial, performing duets and displays during breeding season (three pairs displaying and singing in Nov–Dec). Very aggressive towards raptors and other potential nest predators, such as Frances's Sparrowhawk (*Accipiter francesii*), which once recorded as driven away but suspected to have returned and taken chick(s). Nest a neat substantial cup, built 7–9 m above ground on (rather than in) small fork at end of outer branch of tree. Clutch 1–2 eggs, possibly more; both parents attend nestlings, male observed to feed female at nest and she fed young. No other information.
Movements. Resident.
Status and Conservation. ENDANGERED. Restricted-range species: present in Comoro Islands EBA. Rare and uncommon within its tiny global range, estimated at only c. 150 km² on an island covering 1147 km²; extremely small population localized on flanks of Mt Karthala, an active vol-

cano. Population estimated at c. 100 birds in 1985, although there may be more. Mostly restricted to a few sites around Mt Karthala; present mainly around Nioumbadjou, but recorded also at lower elevations down to near sea-level on SW coast near Zikaledjou, Singani, the R Denga-denga bridge, Salimani and Mvouvouni; found also at Malakoff and Hantsangoma, on N side of mountain, and around Kourani, Tsinimoipanga, Boboni, Mvouni and Mlima Manda, on W side. Quality and extent of native habitats have been declining over recent decades, but species is too sparsely distributed to enable speculation on its population trends; it survives in exotic degraded vegetation and does not appear to be declining. Reasons for its scarcity largely unknown, possibly high nest predation by introduced rats (*Rattus*), which abundant in the forest, and other predators, such as lesser Indian civet (*Viverricula indica*) and small Asian mongoose (*Herpestes auropunctatus*), or scarcity of large insects, or the fact that (some of) its present distribution may be in marginal habitat. Field surveys are required to investigate the species' biology and ecology, to establish its current population, range and status, and to investigate possible limiting factors. Main threats to native habitats around Mt Karthala are clearance for agriculture, the spread of thicket-forming invasive exotic plants, commercial logging, and a road-building project to provide access to the crater (although how this would affect the species is unclear). A protected area has been proposed on Mt Karthala, extending below the native forest edge in S, in order to encompass most of species' known range. Maintaining or re-creating of habitats of appropriate structure (e.g. reforestation of grasslands on C ridge) should benefit the species. A programme aimed at increasing public awareness and influencing decision-makers is recommended, and development of ecotourism could be an alternative source of income for local communities.

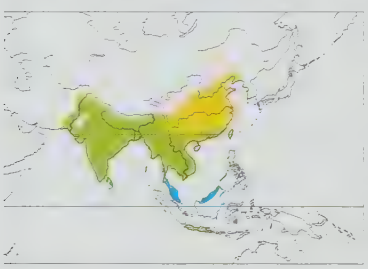
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21. Black Drongo

Dicrurus macrocercus

French: Drongo royal **German**: Königsdrongo **Spanish**: Drongo Real
Other common names: (Common) King Crow, Black King Crow; South Indian Black Drongo (*macrocercus*); North Indian Black/Himalayan Black Drongo (*albirictus*); Ceylon Black Drongo (*minor*); Chinese Black Drongo (*cathoecus*)

Taxonomy. *Dicrurus macrocercus* Vieillot, 1817, Madras City [Chennai], Tamil Nadu, India.
Forms a superspecies with *D. adsimilis* and often treated as conspecific, but differs slightly in plumage and significantly in proportions and voice; close relationship between the two supported by recent DNA studies. Previously, *D. fuscipennis*, *D. modestus*, *D. waldenii*, *D. forficatus* and *D. aldabranus* thought to be part of same superspecies, but morphological and genetic differentiation considered too great to validate such a relationship. Race *albirictus* intergrades with nominate in SE Pakistan and across C India (in narrow band roughly from Kutch, in W Gujarat, E to S West Bengal) and with *cathoecus* in NW Myanmar; *cathoecus* and *thai* may intergrade in N Thailand. Seven subspecies recognized.
Subspecies and Distribution.
D. m. albirictus (Hodgson, 1836) – Himalayas from E Afghanistan and N & E Pakistan E to W & extreme N Myanmar and S China (SE Xizang), S to SE Pakistan (E from Indus Valley) and across C India (S to Gujarat, N Madhya Pradesh and West Bengal; non-breeding also S to S India, C & S Myanmar and N Thailand.
D. m. macrocercus Vieillot, 1817 – SE Pakistan and peninsular India S from Gujarat, Madhya Pradesh and West Bengal.
D. m. minor Blyth, 1850 – N & NW Sri Lanka (S, in W, to Puttalam), including Mannar I.
D. m. cathoecus Swinhoe, 1871 – breeds C, E & S China (E from Qinghai, S from Jilin; including Hainan I), Myanmar (except W & N), N Thailand and N Indochina; non-breeding S to SW & S Myanmar, S Malay Peninsula (Singapore) and S Indochina.
D. m. thai Kloss, 1921 – S Myanmar (Tenasserim), C & E Thailand, probably E Cambodia, and S Indochina.
D. m. harterti Stuart Baker, 1918 – Taiwan.
D. m. javanus Kloss, 1921 – Java and Bali.
Introduced (race *harterti*) in S Northern Marianas (on Rota I), from where colonized Guam.



Descriptive notes. c. 30–31 cm (nominate), 27–28·5 cm (*thai*), average male 27·9 cm and female 26·9 cm (*harterti*), c. 26 cm (*minor*); male 39–59 g, one female 41 g (*albirictus*), 40–51 g (nominate). Nominate race has white rictal spot relatively large at gape, matt black lores, forehead and forecrown; rest of head and body plumage deeply lustrous black, uniformly glossed with dull steel-blue, inner webs of primaries grey-brown, darkening at tips; lining of wings pale silvery brown; semi-translucent primaries visible in flight; long tail (158 mm) deeply forked (60 mm), outer pair of rectrices curving slightly outwards and rarely also slightly upwards (disappearing when in moult); iris blood-red to deep crimson; bill rather broad and short, upper mandible curved and slightly hooked, black; legs black to dark grey. Differs from very similar *D. adsimilis* in having tail longer than wing (rather than the reverse), tail fork much deeper, white spot at gape, and slightly greater amount of gloss. Sexes very similar, female on average slightly smaller than male. Juvenile has body plumage softer and browner, metallic gloss confined to upperparts, with wing and tail shorter and duller and with less gloss, underwing-coverts and undertail-coverts edged with white, rictal spot larger and conspicuous, iris reddish-brown to brownish; first-year differs from adult in being less glossy below, feathers from lower breast broadly edged with white, undertail-coverts white-tipped. Races differ mainly in size, prominence of rictal spot, and general coloration: *albirictus* is like nominate, but larger in all measurements (wing 153 mm, tail 170 mm, depth of tail fork 66 mm), with comparatively larger white rictal spot; *minor* is smallest race (wing 131 mm, tail 137 mm, fork 47 mm), white rictal spot not always directly perceptible (sometimes consisting of only a single feather), bill smaller and weaker; *cathoecus* is similar to nominate in size (slightly longer wing and bill, shorter tail less deeply forked), but differs in having wing-linings dark (instead of pale), greener gloss on wings and tail, rictal spot much smaller and concealed, and is apparently only race with dark brown eye; *thai* differs from previous in shorter wing with paler lining, shorter and somewhat less robust bill, longer and considerably more forked tail, and has rictal spot usually lacking or very small and hidden; *harterti* is similar to *albirictus* in long wing and bill lengths, but differs in having tail on average (148 mm) shorter than wing (152 mm), often with generally greener gloss (although some individuals bluer), rictal spot very small and hidden; *javanus* is bluish, rather than greenish as in neighbouring *thai*, differs from latter further in somewhat shorter and less deeply forked tail, rictal spots almost always lacking. Voice. Powerful and harsh vocalizations. Particularly noisy at start of breeding season, mainly during two hours preceding daybreak; partners frequently engage in duet of raucous 2-note calls while displaying. Songs include vehement and jarring strophes of syncopated, jangling and creaky squawks, mostly on even pitch, first often shorter and harsher, last also shorter and a few more nasal; also pleasant warbling with melodious phrases and few churrs in Orissa (E India), "tit-ti-tu-wut" in Rajasthan (W India), and combination of musical whistles and harsh sounds in Nepal (race *albirictus*). Song in Sri Lanka (*minor*) more melodious than those of congeners. Varied calls, including spaced, short, harsh, single monotonous or rising notes; also harsh double-noted "ti-tiu" like that of Shikra (*Accipiter badius*), "cheece-cheece-chichuk" call, raucous scraping or metallic sounds, also beautiful clear whistles; in Thailand, race *cathoecus* gives diverse churrs and soft nasal chatters. Accomplished mimic, especially when excited by predator such as cat or snake, imitates alarm notes of other birds.
Habitat. Mostly open country and farmland with scattered trees; very common also in villages and suburbs, parks and gardens, perching on telephone wires and poles, and on roadside trees. Race *albirictus* common and widespread in plains and openly wooded hills, e.g. with oak (*Quercus*) and rhododendron (*Rhododendron*), but not quite so exclusively an open-country bird as nominate, nesting occasionally in thin forest or well-wooded country at considerable distance from human settlements; to 2600 m in Pakistan, and to 1500 m (occasionally to 2000 m in summer) in Nepal. In Sri Lanka, common in coastal belt in open land, tobacco and pasture fields, bushy plains. In China, common in plains, where frequently seen on roadside poles, and reported particularly on willows (*Salix*) along bank of pools; to 1600 m in summer in Yunnan. Plains and hills in open country in Myanmar. In Malay Peninsula an entirely non-forest drongo, passage migrants and non-breeding visitors favouring rice fields, particularly at late-crop and post-harvest stages, also market gardens, open grassland and grass-swamp with grazing water buffaloes (*Bubalus bubalis*). In Java and Bali, and Sumatra (where rare), occurs in open spaces and agricultural land, where it follows domestic livestock.
Food and Feeding. Food predominantly insects (often agricultural pests), including locusts, grasshoppers and crickets (Orthoptera), beetles (Coleoptera), bugs (Hemiptera), termites (Isoptera), ants and bees (Hymenoptera), even ferocious rock bees (*Apis dorsata*), also moths, butterflies and larvae (Lepidopera), damselflies (Zygoptera); occasionally, mainly on Indian Subcontinent, diet reported as much more varied, including lizards, small bats, and nestlings and small birds such as flycatchers (*Muscicapa*), prinias (*Prinia*), white-eyes (*Zosterops*), ioras (*Aegithina*), swallows (Hirundinidae); cattle ticks (Ixodoidea), considered an important food resource in Sri Lanka. Reported as feeding on dead fish floating on muddy water, frequently flying to perch on nearby tree, carrying a fish c. 10 cm long in bill. Also seeks nectar (from *Bombax ceiba*, *B. insigne*, *Butea monosperma*, *Erythrina*), during which forehead and throat feathers become covered with pollen (thus helps in cross-fertilization of plants). In Gujarat (India) one individual reported as feeding on sorghum (*Sorghum vulgare*) grains; took 30 grains in ten minutes by pecking repeatedly under its feet while perched on top of the ear. Regularly reported as pirating worms (Annelida) or other prey from Hoopoes (*Upupa epops*), mynas or wagtails (*Motacilla*). Spends middle of day calmly on shady trees. Forages mainly in morning and evening hours, hunting insects attracted by electric lights as late as 2–4 hours after sunset. Perches on wires, fence posts, posts, bare treetops, earth banks or other vantage, sallying to catch prey on the wing, to seize it among herbage, or to snatch termites and other insects emerging from ground. During human activity in rice fields, perches close by on elevated posts and pounces on insects disturbed or exposed by the plough; feeds also on ground, swooping down on prey and either eating it immediately or carrying it in bill to perch. Tears larger items to pieces before swallowing them; removes wings of damselflies and other large-winged insects before consumption. Usually solitary, but will gather in numbers to feed on swarming winged termites or emerging mosquitoes (Culicidae); attracted to forest fires and areas of burning grass, where it captures escaping insects, even amid thick rising smoke. Also joins parties of Yellow-billed Babbler (*Turdoides affinis*) or Jungle Babbler (*Turdoides striata*), hawking insects flushed by the babblers, the latter (not competing for food, as near-ground foragers) benefiting from protection afforded by drongo against predators; same behaviour and benefit observed in associations with ground-feeding flocks of Jungle Myna (*Acridotheres fuscus*) and/or Common Myna (*Acridotheres tristis*). Foraging trips of present species considerably more successful when with medium-sized and large myna flocks. Associates also with mammals, mainly cattle, water buffalo or goats, catching insects disturbed by them; often uses back of cattle as mobile perch. Outside breeding season, roosts in trees or bamboo groves, dispersing at dawn to feeding areas; hardly enters closed tree cover during daytime, often foraging far from any trees.
Breeding. Season Mar–Jun in Pakistan, Mar–Aug (principally mid-Apr to end Jun, sometimes second brood Jul–Aug) in India, and Mar–May in Sri Lanka; Apr–Aug in China, but mainly Apr in Taiwan and May–Jun in Hong Kong; Apr–Aug in SE Asia, most eggs laid in Apr–May in Myanmar, Apr–Dec in Java and Bali. Cases of helpers at nest reported in India, e.g. three fledglings accepting food from parents and two additional conspecifics; also, a Red-vented Bulbul (*Pycnonotus cafer*) partaking in the feeding of three chicks in and, later, outside nest, even almost simultaneously with parents. Solitary nester, territorial; drives crows (Corvidae) and raptors out of territory, pursuing them for 200–300 m through air, and even landing briefly on back of flying Short-toed Snake-eagle (*Circaetus gallicus*) in India or Black Kite (*Milvus migrans*) of race *lineatus* in Hong Kong. Partners display by facing each other, 10–20 cm apart on perch, and indulging in rapid head-bobbing while duetting; also trios and quartet noticed in SW India (Kerala). Nest built by both sexes, taking 5–8 days (average 6 days), a flimsy-bottomed broad shallow cup, sides rather firm and thick, internally 10 cm in diameter and 4 cm in depth, made from tiny twigs, rootlets, fine grass stems and other vegetable fibres, e.g. roots of khus-khus grass (*Vetiveria zizanioides*) in India, fibres from fronds of coconut palm (*Cocos nucifera*) or twigs of gooseberry tree (*Phyllanthus emblica*), tightly woven together and plastered with cobweb, frequently lined with horsehair or fine grass, the outside often including pieces of lichen, moss, bark, spider egg sacs and the like; most often 4–7 m above ground, but up to 13 m and down to 2–3 m (even close to ground in Java or Bali), in horizontal fork at extremity of tree branch, also reported as laying on horizontal support, generally fork of strong twigs in tree, sometimes in upright fork of lower branches, or even on man-made structure (e.g. between horizontal and vertical sections of electricity pole in Andhra Pradesh, in India); nest tree often mango (*Mangifera indica*), but also *Lagerstroemia parviflora*, jackfruit (*Artocarpus integrifolia*), cashew (*Anacardium occidentale*), tamarind (*Tamarindus*), oak and many others, such as sheesham (*Dalbergia sissoo*), acacia e.g. babool (*Acacia nilotica*) or kandi (*Prosopsis spicigera*), in Taiwan also on waving branch of bamboo; chosen tree usually solitary and standing in the open, with unobstructed view of surroundings; in SW India (Calicut), nests 2·5–13 m up, on tree 5–30 m tall and usually 18–40 m from any other nesting tree, territory size 0·3–1·2 ha. Clutch 2–5 eggs, usually 3 or 4 in India (but 3–5 in Kerala), 2–3 (rarely, 4) in Sri Lanka, 3–4 and rarely 5 in E of range (race *cathoecus*), 2–3 in S (*javanus*); extremely variable, from pure white or white with sparse dark brown speckles (mostly in N) to warm pink-salmon with reddish-brown, purple-brown and burnt sienna blotches, chiefly at large end, over underlying purple markings (more in S), and all kinds of intermediates, average size 27·1 × 19·8 mm (*albirictus*),

24–27 × 18·5–20·5 mm (nominate), 24·2 × 18·1 mm (*minor*), 26·5 × 19·5 mm (*cathoectus*); up to two replacements laid if clutches lost in early stage of incubation (no re-laying if lost at advanced stage of incubation); incubation by both sexes, in some cases male taking prominent part, period mainly 14–16 days; eggs hatch asynchronously over 24–28 hours; chicks fed by both parents, nestling period mostly 16–17 days, sometimes to 20 days; fledglings dependent on parents for c. 30 days. Nests parasitized by Indian Cuckoo (*Cuculus micropterus*) in India and SE China, and by Common Koel (*Eudynamys scolopacea*) in India; also, in India and in C & S China, by Asian Drongo-cuckoo (*Surniculus lugubris*), so closely similar in shape and color that it is often mistaken for present species. Breeding success linked to availability of insects, and hence to date of first monsoon showers, which are followed by sprouting of grasses and flush of insects. Both sexes apparently breed for first time when c. 2 years old.

Movements. N populations migratory or partly migratory. Those in NW of range (race *albirictus*) winter at lower altitudes and latitudes, S to E Afghanistan and S Pakistan, C India, C & S Myanmar, N Thailand; rarely recorded in United Arab Emirates, and vagrant in Oman; in most of Pakistan except Baluchistan, *albirictus* is mainly a summer breeding visitor, arriving in Mar and departing in Oct. In China, *cathoecus* is principally a summer visitor, breeding birds present May–Sept in Henan; in Hong Kong main arrival about mid-Apr and most have left by late Oct, spring passage in loose groups of 10–20 individuals, larger groups up to 150 on autumn passage; migrates through SE China to SE Asia; resident in Hainan and partly in Yunnan E to Guangdong and Fujian. In Myanmar, majority breed in C & N late Mar/early Apr–Oct, migrating to S, where few are sedentary; seems to be less migratory in S Irrawaddy valley (where breeds in May and Jun). Race *cathoecus* also a passage migrant and winter visitor to whole Thailand and to Malay Peninsula, where observed near coast, usually in lowland (but recorded to 800 m); migration counts of this species in autumn 2003 at freshwater marsh in S Thailand totalled c. 11,300, with daily peak at 08:00–10:00 hours and a smaller peak in late afternoon, rarely after 18:00 hours (in contrast to *D. annectans*, frequently netted at night), with no significant differences related to wind direction but with heavy peak (highest single hourly count 618 birds) following two days of heavy rain throughout Thailand; passage in singles early in season, then small flocks of 5–20 individuals, sometimes across 30-m front. Regular migrant in Japan and Korea; vagrant in Mongolia (Gobi) and SE Russia. Vagrants from E Asia recorded Apr–Jun in Sumatra; regular but rare in lowland forest, mangrove, peatswamp, alluvial forest and dipterocarp forest up to 500 m in NW Borneo. In Sri Lanka, wintering birds occurring in S part of dry zone possibly migrants from India.

Status and Conservation. Not globally threatened. Common throughout range in Indian Subcontinent; race *albirictus* formerly occurred also in SE Iran. Common resident and migrant in mainland SE Asia, including E China; especially common in Hong Kong during spring and autumn passages. Migration through and in Thailand has declined in recent years; in 1920s species considered "extremely abundant" migrant in Sept, occurring in "huge noisy parties", but far fewer seen now. Resident race *javanus* widespread in Java and Bali, but now seen less often than was previously the case. Two other island races, in Taiwan (*harterti*) and Sri Lanka (*minor*), have restricted ranges but are very common and widespread in farmland and open plains; both islands, already affected by large-scale destruction of natural forest, are still subject to deforestation through firewood-gathering, clearance for permanent agriculture, shifting cultivation, tree plantations, and rapid urbanization of rural lands; most of the protected areas in Sri Lanka within the dry zone benefit the local drongo. This species, which attends ploughing operations along with several others, such as Common and Bank Mynas (*Acridotheres ginginianus*), House Crow (*Corvus splendens*) and Cattle Egret (*Bubulcus ibis*), may be considered an efficient agent in control of white grub (*Holotrichia*) in commercial crops, being economically cheaper and environmentally safer than chemicals. On the other hand, following introduction of this species in 1935 in Northern Mariana Is (to control destructive insects), it has become a serious threat to the native forest avifauna of the islands, as it preys on endemic species, notably the Critically Endangered Rota White-eye (*Zosterops rotensis*).

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22. Fork-tailed Drongo

Dicrurus adsimilis

French: Drongo brillant **German**: Trauerdrongo **Spanish**: Drongo Ahorquillado
Other common names: African Drongo

Taxonomy. *Corvus adsimilis* Bechstein, 1794, Duiwenhok River, southern Cape, South Africa.

Forms a superspecies with *D. macrocercus* and often treated as conspecific, but differs slightly in plumage and significantly in proportions and voice; close relationship between the two supported by recent DNA studies. Previously, *D. fuscipennis*, *D. modestus*, *D. waldenii*, *D. forficatus* and *D. aldabranus* thought to be part of same superspecies, but morphological and genetic differentiation considered too great to validate such a relationship. Race *divaricatus* intergrades with *fugax* in N Uganda and Kenya. Four subspecies recognized.

Subspecies and Distribution.

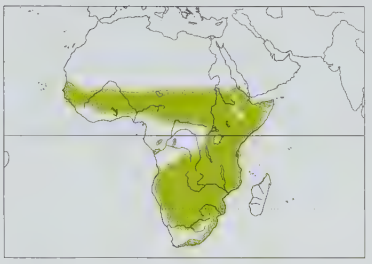
D. a. divaricatus (M. H. C. Lichtenstein, 1823) – SW Mauritania, Senegambia and Guinea E in savanna belt to N Cameroon, S Chad, C & S Sudan, Ethiopia, Eritrea and Somalia, S to Central African Republic, N DRCongo, N Uganda and N Kenya.

D. a. apivorus Clancey, 1976 – SE Gabon and adjacent PRCongo, WC & S DRCongo, Angola, N & W Zambia, Namibia, Botswana and N South Africa (N Northern Cape E to N Limpopo).

D. a. fugax W. K. H. Peters, 1868 – Uganda, Kenya and Tanzania (including Zanzibar) S to E Zambia, Malawi, Mozambique, Zimbabwe, E Botswana, NE South Africa (E Limpopo S to NE KwaZulu-Natal) and E Swaziland.

D. a. adsimilis (Bechstein, 1794) – W Swaziland, Lesotho lowlands, and E & S South Africa (S Mpumalanga and KwaZulu-Natal S to SW Western Cape).

Descriptive notes. 23–26 cm; 34–48 g (*divaricatus*), 48–53 g (nominate). Nominate race is almost entirely black, glossed blue-green on head, upperparts, breast and flanks; upperwing black with slight greenish gloss, primaries and secondaries browner than rest of wing, inner webs of flight-feathers grey-brown (paler underside of remiges producing paler reflection in flight), primary coverts blackish with narrow glossy outer edge, belly and undertail-coverts sooty black; tail fairly long



(115–126 mm) and deeply forked (depth 19–23 mm); iris red; bill and legs black. Differs from very similar *D. macrocercus* in having tail shorter than wing (rather than the reverse), tail fork less deep, slightly less gloss, no pale rictal spot; from *D. ludwigii* and *D. atripennis*, in larger size and deeper tail fork. Sexes similar. Juvenile is dark sooty brown, with few buffish feather tips, tail fork less pronounced, iris brown, gape pale; immature resembles adult but without gloss on underparts, pale feather tips on underparts. Races differ mainly in size, in depth of tail fork and in colour of inner webs of flight-feathers: *apivorus* is large, as nominate, but has inner webs of flight-feathers pale grey-buff (as in following race), juvenile has buffy tips on body feathers, fine whitish margins on upperwing-coverts and secondaries, white tips on underwing-coverts and axillaries; *fugax* is smaller, with deeply forked tail (23–27 mm), and pale grey-buff inner webs of flight-feathers, juvenile as last; *divaricatus* resembles previous, but with shallower tail fork (8–20 mm). Voice. Very vocal; often the first bird to sing at dawn and last to be heard at dusk. Pre-dawn calls include rasping "jwaaa-jwaaa" and "jeewy-jeeerr". Extremely varied repertoire of sharp calls, short whistles and squeaky, liquid, grating and scratchy notes, given in rapid succession or between long pauses to form a song sometimes described as discordant twangy jumble, e.g. "drit-drit, woyglo-jit, drit-o, jewp-jewp, click-click, gliglaagligloo, jick-glo-jeea" and so on; rasping sounds like those made by unoiled wooden wheel. Single calls include "chyup", "tjaaa", loud "jer-woo" and whistled "jee-lu". Partners perform synchronous duets lasting c. 4–5 minutes and consisting of c. 12–20 rapidly alternating elements by each partner. Songs sometimes dominated by soft, high-pitched, nasal and scratchy sequences (especially nominate race), or by melodious whistles and chirps, grinding sounds and liquid chatters. Imitates perfectly calls of other bird species, e.g. Bocages's Bush-shrike (*Chlorophoneus bocagei*), thrushes (Turdidae), tchagras (*Tchaghra*) and bulbuls (Pycnonotidae), also raptors such as Shikra (*Accipiter badius*) and African Goshawk (*Accipiter tachiro*), and at dusk or during moonlit nights owls such as Pearl-spotted Owlet (*Glaucidium perlatum*); mimicry of mewing cat reported in Kenya. Scratchy three-syllable "my-dear-chap" given before attacking intruding raptors.

Habitat. All types of wooded habitats except dense forest, mainly from sea-level to low hills, including open woodland and savanna, moist or dry, also riverine woodland and tree plantations, agricultural land and grasslands with scattered trees, along roadsides with wires or other perches; also city parks, gardens and exotic plantations. In more dense woodland, prefers edges, glades and clearings. Equally common in semi-arid bushland, acacia (*Acacia*) woodland and moist coastal secondary woodland in E Africa, where found to 1800 m. Avoids highlands, but reaches 2200 m in Kenya.

Food and Feeding. Food mostly large insects, including moths and butterflies (Lepidoptera), grasshoppers (Orthoptera), beetles (Coleoptera), cicadas (Cicadidae), also winged ants (Formicidae) and termites (Isoptera) during emergences, also bees (Apoidea); reported near hives. Small birds, such as Bronze Munia (*Lonchura cucullata*), sometimes captured and carried away in claws or bill; also captures small fish by swooping down from perch, hovering over water and dipping. Reported as probing aloe (*Aloe*) flowers, and consuming nectar. Perches in upright posture on conspicuous branch, from which it sallies out to pursue large insects, seizing them in the air, on vegetation or on ground, often returning to same branch. Occasionally forages on the ground. Holds large items with the claws and cuts them into pieces with the bill; removes wings of Lepidoptera before swallowing them. Bold and fearless; will steal food from other birds. Reported as hawking moths at night and as following ants in Tanzania. Singly and in pairs, sometimes in small groups; occasionally joins mixed-species flocks, where it catches insects disturbed by other flock-members. Associates with wild game (occasionally perching on animals) and domestic livestock; attends savanna fires, where it catches fleeing insects and other prey close to the flames.

Breeding. Season roughly Mar–Sept N of equator and Sept–Jan S of it; Apr–Jul in W Africa, Nov–Jun (mainly Feb–Apr) in Nigeria; Apr–Jun in Sudan and Mar–Sept in Ethiopia; in DRCongo, Feb–Mar in N (Uele) and Aug–Oct in SE (Katanga); Sept–Oct in Malawi and peak Sept–Nov in Zimbabwe; two and sometimes three broods in a season. Monogamous. Aggressively territorial towards other drongos; also chases and mobs nest predators, including birds of prey and crows (Corvidae), hornbills (Bucerotidae), shrikes (Laniidae) and others (will cling to back of intruder and peck it while in flight); pursues and attacks small mammals and snakes. Partners often perch together, and perform duets and displays, with bowing and bobbing of head. Nest saucer-shaped, c. 10–11·5 cm in diameter and 5 cm in depth, interior cup 7·5 across and 2·5 cm deep, made with fine plant stems, lichens, rootlets, tendrils and similar material, bound with cobweb, walls and floor so thin that eggs generally visible from outside, placed 2–12 m (usually 5–7 m) above ground, usually slung between fork of horizontal branch (often in the open), firmly fastened with rim of leaf petioles, cobwebs or lichens around top; occasionally a larger bowl of plant material and sheep wool, built on top of horizontal branch. Clutch 1–4 eggs, usually 3 (average 2·7 in Malawi, 2·8 in South Africa), very variable (five main colour types identified), some plain white, cream or pinkish-cream, others with irregular blotches of red-brown or various shades of ashy pink, usually at large end, some speckled black and charcoal-grey, average size in S Africa 24·3 × 18·2 mm; incubation 16–17 days; chicks fed by both parents, both also remove faecal sacs, nestling period 17–18 days. Exclusive host of African Cuckoo (*Cuculus gularis*); also parasitized by Jacobin Cuckoo (*Clamator jacobinus*) in South Africa.

Movements. Resident; possibly some short-distance movements in S.

Status and Conservation. Not globally threatened. Generally common to abundant and widespread in all kinds of open woodland habitats; one of the commonest birds of African savanna. Scarcer to locally uncommon in some parts of range in dry areas, including Sahel (in N) and W Karoo and Namibian coast (in SW), also in deep forest, and in grassland or highlands (e.g. Lesotho). In S Africa, 1 pair/11–30 ha in acacia woodland; and 13, 18 and 25 birds/100 ha in, respectively, mopane (*Colophospermum*), acacia and miombo (*Brachystegia*) savanna. Thought unlikely to become threatened in the foreseeable future, as it benefits from tree-cutting in dense forests and from tree-planting in grasslands.

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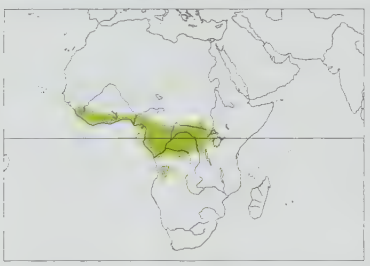
23. Velvet-mantled Drongo

Dicrurus modestus

French: Drongo modeste **German**: Samtdrongo **Spanish**: Drongo Modesto

Other common names: Forest Drongo; Principe Drongo (*modestus*)

Taxonomy. *Dicrurus modestus* Hartlaub, 1849, Principe, Gulf of Guinea.
Sometimes treated as conspecific with *D. adsimilis*, but recent DNA analysis supports recognition of two distinct species; both were previously thought to be part of a superspecies with *D. fuscipennis*, *D. macrocercus*, *D. waldenii*, *D. forficatus* and *D. aldabranus*, but morphological and genetic differentiation too great to support such a relationship. Additional studies needed to clarify taxonomic position of races *coracinus* and *atactus*, which intergrade fully in SW Nigeria (Ondo and Benin provinces) and Cameroon; *coracinus* and race *divaricatus* of *D. adsimilis* behave more or less as distinct species, differing in behaviour, voice and plumage, with limited hybridization in areas of range overlap (apparent hybrids reported in Nigeria, DRCongo and Angola); *atactus* initially described as a possible hybrid between those two taxa. Proposed race *ugandensis* regarded as a synonym of *coracinus*. Three subspecies currently recognized.
Subspecies and Distribution.
D. m. atactus Oberholser, 1899 – Sierra Leone, S Guinea, Liberia, Ivory Coast, SW Ghana (S from Kintampo and Tafo), S Togo, S Benin and SW Nigeria; possibly W Cameroon, possibly also N Angola, possibly also E DRCongo.
D. m. coracinus J. Verreaux & É. Verreaux, 1851 – S Nigeria, Bioko I (Fernando Póo), S Cameroon and SW Central African Republic (Lobaye) E to extreme SW Sudan (Bengegai), W & S Uganda and W Kenya (Kakamega), S to Gabon, PRCongo, NW Angola and C DRCongo (S to Kasai and Maniema).
D. m. modestus Hartlaub, 1849 – Príncipe I, in Gulf of Guinea.



Descriptive notes. 24–28 cm; 44–53 g (mainland races). Nominate race has head and underparts deep velvety black, unglossed except for slight greenish-blue sheen on forehead and crown; mantle and back black with some faint violet-blue reflections (not much visible in field); wing browner, more blackish-brown, and with moderate gloss, looking brighter than rest of plumage, inner webs of flight-feathers dark grey-brown; tail long (male 115–134 mm, female 116–127 mm) and forked (male depth of fork 12–24 mm); iris deep red; bill strong, hook-tipped, black; legs black. Distinguished from *D. ludwigii* and *D. atripennis* by larger size, deeply forked tail and less gloss; from *D. adsimilis* by darker underside of flight-feathers, less (or no) gloss on back and underparts. Sexes alike in plumage, male slightly larger than female. Juvenile has pale barring on central belly and undertail-coverts, brown iris. Races differ in size and proportions, colour of mantle and degree of contrast with head and nape, colour and relative darkness of flight-feathers and their inner webs: *coracinus* is smaller and slightly less glossy than nominate, has thicker and more visibly velvety black mantle with bluish tinge (but virtually unglossed), contrasting bluish-glossed dark crown and nape, dark brownish wings with upperwing-coverts and tertials glossed greenish, flight-feathers tinged brownish on upper surface and greyish below, edges black with greenish gloss, underparts dull bluish-black, tail shorter (male 102–117 mm, female 105–113 mm) but more deeply forked (male depth 15–29 mm), iris orange-red to deep scarlet, juvenile lacks barring below; *atactus* is similar in size to previous, dark glossy violet-blue all over, gloss stronger on upperparts (much more visible than on nominate), back a little darker but not velvety, wings and tail glossed steely green, inner webs of flight-feathers more brownish (less blackish) than in previous race and with very glossy underside (as if covered with oil), tail length (male 104–116 mm, female 103–114 mm) and fork depth (male 14–29 mm) much as for last race, juvenile barred on lower belly and undertail-coverts. Voice. Extensive and very varied repertoire of twangy whistles and fluty notes, nasal harsh calls and scratchy sounds, including loud rasping like sound of tearing paper. Race *coracinus* described as very noisy in forests of Gabon and DRCongo. Voice more ringing and melodious than that of *D. adsimilis* and with similarities to (possibly imitations of) other drongos, e.g. "dzaa-dzaa-weet-wheep" or "dza-ti-ti-way-tea-wait" reminiscent of *D. ludwigii* in Cameroon, and rasping "jarr-jarr" and pure whistles much like those of *D. atripennis* in Gabon (where individual once observed singing while bathing). In Gabon variety of tit-like calls, e.g. "tee-ta" or plaintive churrs alternating with harsh notes; in Cameroon a very regular trisyllabic refrain, fluty and melodious, "whip-whip twuut", sometimes given in regular descending tones; in Uganda repeated nasal phrases, e.g. "chi-chi-wew-jor-chop" and "woo-titi-woo-titi-woo-tititawoo", with many variations. In Cameroon, pairs duet from songposts at forest edge with scratchy tuneless phrases, very much like those of *D. adsimilis*. On Principe, typical stereotyped vocalizations of nominate race clearly different from those of mainland races, include regular soft "weeh, yiup, yiup, yiup", or repeated "tieu wee tiuh" ending with "tieu weeeh"; various hoarse calls, including brief "krrueink", long "kchiiiir", "kchtuiiiin" or "zwuiiiin"; also a loud and hoarse call, rarely heard, described as unmusical and dissonant, unpleasant, nearly frightening, more similar to cry of a cat than to that of a bird; also, a short and monotonous plaintive cat-like call repeated between long silences.
Habitat. Wide range of habitats. On Principe, nominate race found in practically all main types of wooded habitat: patches of primary forest below 600 m (and possibly higher), mature or dense secondary forest, plantations, and sparsely wooded clearings around isolated farms; appears to have adapted to more open habitats such as coffee and cocoa plantations; often seen perched on roadside wires. Race *coracinus* mainly in lowland forests, but also to 1600 m in Cameroon, E DRCongo and Kenya, avoiding lower and dense vegetation layers, with preference for forest-edge canopies, large trees along tracks and roadsides, and gallery forest; avoids open habitats in areas where *D. adsimilis* present (e.g. Uganda, Kenya), but also where it is absent (e.g. Gabon, S Nigeria); occupies forest edges and clearings, farmland, plantations, forest–grassland mosaic, and other man-made open habitats with large trees; on Bioko present in dense forest at up to 1200 m, and also in upper canopy of cotton tree (*Bombax*) within coastal cocoa plantations. W African race *atactus* occurs in mature and secondary forests (e.g. Nigeria), glades and clearings in both lowland and montane forests (to 1100 m in Liberia), forest–grassland mosaic, gardens, parkland country and savanna, riverine forests. Original habitat high canopy of mature and old secondary forest, perching often in shade of lower canopy (mainly above 25 m in canopy in Liberia), hence well separated ecologically from *D. atripennis*, which occupies mature forest understorey where the two species co-exist.
Food and Feeding. Mainly insectivorous, feeding on grasshoppers (Orthoptera), beetles (Coleoptera), termites (Isoptera), cicadas (Cicadidae), mantids (Mantidae), moths and butterflies (Lepidoptera), and bees and wasps (Hymenoptera). Pieces of bark found in stomach contents on Principe. Insects caught mainly in air; sometimes makes circular flight to catch larger insects, also swoops to pick prey from ground, gleans from high branches and foliage, and sallies above canopy. Large prey items held with feet and dismantled with bill. Often hunts at dusk, almost nocturnally. Race *coracinus* rather shy and forages near forest openings and tracks; perches upright on tree branch 6–10 m high. Race *atactus* more noisy and lively, foraging higher in canopy (over 25 m in Liberia), hovering, gleaning, and sallying out; frequent member of mixed-species parties. On Principe, nominate race reported as less active and having less burst of speed than its continental counterparts, often perching in pairs on dry branches in treetop and remaining inactive for long periods; occasionally seen to pounce on insects from branch only 4–5 m above ground. Found singly, in pairs and small parties of 3–4 individuals; groups of up to eight reported from Principe.
Breeding. Nestlings and fledglings in May–Jun in Liberia, season Dec–Feb in S Ghana; breeds May–Jun and Oct–Nov, possibly all year, in S Nigeria; Nov–Mar (main dry season) in Cameroon, and Sept–Dec in Gabon; breeds Sept–Jan (middle of short dry season) on Principe; probably all year (recorded Jun, Jul, Nov and Mar) in E DRCongo. Territorial, and aggressive towards large birds such as hornbills (Bucerotidae) and raptors, sometimes also smaller birds such as cuckoos (Cuculidae), kingfishers (Alcedinidae) and weavers (Ploceidae); race *atactus* reported as mobbing crows (Corvidae), herons (Ardeidae), cranes (Gruidae), vultures (Accipitridae), kites (*Milvus*), buzzards (*Buteo*) and hornbills, sometimes soaring above and clinging on to back of the intruder. Displays and duets from prominent posts during breeding season, male singing and bowing from side to side while female crouches and flutters wings. Nest a shallow cup made from interlocked thin twigs and rootlets, fibres (e.g. black palm) and lichens, bound together with cobweb, placed on thin fork near end of lateral branch, in Liberia (race *atactus*) 6–18 m above ground in secondary forest and 30–40 m up in primary forest; territory 6–10 ha in Gabon (*coracinus*). Clutch up to 3 eggs. No further information.
Movements. Resident.
Status and Conservation. Not assessed. Thought not to be globally threatened. Widespread and locally common; scarce in some parts of range, as in S Benin (Pobe) and extreme SW Nigeria (*atactus*), and very rare in S Togo. Distributional limits of race *atactus* uncertain; possibly present in W Cameroon, and isolated specimens described from around rainforest in N Angola and E DRCongo (Ruzizi valley, in Uele; NW L Tanganyika). Densities of up to 10 pairs/100 ha in Liberia mature forest (*atactus*) and 10–16·7 pairs/100 ha in Gabon (*coracinus*). Nominate race, restricted to Principe I (136 km²), is widespread in open and forested habitats except primary forest on C massif, commonest in open plantations and edge habitats; numbers unknown but probably small, and taxon, when treated as a full species, is considered Near-threatened owing to its small range and various threats, such as increased use of pesticides (leading to reduction in prey availability) and reduction in tree cover following expansion of farmland. Likely niche extension by this race to man-made habitats may have partly compensated for a possible decrease in its abundance since 1950s.
Bibliography. Anon. (2008i), Bannerman (1939a, 1953), Bates (1930), Bocage (1903), Borrow & Demey (2001), Brosset & Érard (1986), Butchart & Stattersfield (2004), Chapin (1954), Cheke & Walsh (1996), Christy & Clarke (1998), Dean (2000b), Dekeyser & Derivot (1966), Dohrn (1866), Elgood *et al.* (1994), Fry *et al.* (2000), Gatter (1997), Grimes (1987), Hall & Moreau (1970), Keulemans (1866), Louette (1981), Mackworth-Praed & Grant (1973), McCarthy (2006), Meise (1968), de Naurois (1987, 1994), Pasquet *et al.* (2007), Salvadori (1903), Serle (1950, 1954, 1957), Sibley & Monroe (1990), Snow (1950), Stattersfield & Capper (2000), Vaurie (1949), Zimmerman *et al.* (1996).

24. Mayotte Drongo
Dicrurus waldenii

French: Drongo de Mayotte **German**: Mayottedrongo **Spanish**: Drongo de la Mayotte

Taxonomy. *Dicrurus waldenii* Schlegel, 1865, Mayotte (Maore), Comoro Islands.
Recent DNA studies indicate that closest relatives are *D. forficatus* and *D. aldabranus*; all three previously thought to be part of a superspecies that contains also *D. fuscipennis*, *D. macrocercus*, *D. adsimilis* and *D. modestus*, but morphological and genetic differentiation too great to support such a relationship. Monotypic.
Distribution. Mayotte (Maore), in SE Comoro Is.



Descriptive notes. 34·5–38 cm. Has uniformly deep lustrous black plumage with dark dull greenish-blue gloss; tail very long (175–206 mm) and deeply forked (58–90 mm), distal end of outer rectrices curving strongly outwards; iris red; bill strong, heavier and longer than that of *D. adsimilis* and *D. macrocercus*, black; legs black. Sexes alike, male tending to be slightly larger than female. Immature is more brownish-black and less glossy than adult, with shorter and less forked tail, remiges dull blackish-brown, underparts slightly paler, traces of white tips on undertail-coverts and underwing-coverts. Voice. Very vocal, with extensive repertoire of buzzy and scratchy calls, including loud "tyok" repeated several times, "squa-aa-kuchuk", and throaty "choo-kroo-kreech" at nest. Song includes harsh repetitive jumble of chirps and squeaks, varied whistles, twangy notes and nasal sounds; at times, one pure and melodious note repeated loudly, with long silent intervals between. Pairs perform remarkable duets throughout breeding season at different points in territory (especially in vicinity of nest), with low-pitched "wraaak" immediately followed by contrasting rolling whistles and nasal grinding notes alternated by partners; male calls "chu-chi", female responds with "chu" and male ends with "chit", all of which repeated in rhythm by both birds while displaying. Imitates calls from other bird species, e.g. Common Myna (*Acridotheres tristis*).
Habitat. Occurs mainly in summit rainforests and mixed secondary humid forest above 200 m, including those dominated by mangoes (*Mangifera*), and with maximum densities in last remnants of low-altitude natural forest (at Sohoa). Also, in much lower numbers, in adjacent degraded forest patches alternating with ylang-ylang (*Cananga odorata*) plantations, orchards, forest clearings and agricultural fields; marginally in mangroves and adjacent mature woodland. Seems to prefer wet locations, with high percentage cover of tall trees, within large forest patches at higher altitude.
Food and Feeding. Mainly insectivorous. Recorded prey include cicadas (Cicadidae) and other homopteran bugs, butterflies and moths and caterpillars (Lepidoptera), wasps (Hymenoptera), mosquitoes (Culicidae) and other flies (Diptera), grasshoppers (Orthoptera), water-beetles and other beetles (Coleoptera), also spiders (Araneae) and millipedes (Diplopoda). Cicadas (Cicadidae) represent almost half of prey, and play an essential role during breeding season. Possibly takes some small vertebrates such as small skinks (Scincidae) or chameleons (Chamaeleonidae), but this not yet reported. Exploits mostly vegetation strata between 2 m and 12 m high. Normally hunts from perch, and uses various techniques; sallies out in manner of flycatcher (Muscicapidae), glides down, hovers, and slaloms between stands of vegetation. Captures insects between ground level and more than 20 m up, half of them in flight, the rest on trunks, branches, leaves, flowers or the ground; normally catches prey with the bill, but occasionally with claws.
Breeding. Nesting observed between Sept (first eggs) and Feb (last fledglings), coinciding with Nov–Mar rainy season; only one successful brood per year. Highly territorial and extremely ag-

gressive, attacking and chasing from vicinity of nest any potential predator, such as diurnal and nocturnal raptors, e.g. Frances's Sparrowhawk (*Accipiter francesii*) and Common Barn-owl (*Tyto alba affinis*), Common Myna, brown lemur (*Eulemur fulvus*), introduced carnivores and even human observers, but also harmless birds e.g. Madagascar Paradise-flycatcher (*Terpsiphone mutata*) or Madagascar Turtle-dove (*Streptopelia picturata*). Duets and courtship displays throughout breeding season, one bird (presumably the male) offering nesting material or insects to its partner on occasion; partners, while singing, each bob head and body up and down vigorously in rapid alternation, facing and almost touching each other, in a powerful vocal and dancing display. Nest built by both parents, sometimes taking less than a week, a solid rounded cup, external diameter and depth c. 17 cm and 8 cm, internal diameter and depth c. 9 cm and 4 cm, made from intertwined vegetable fibres, placed 5–18 m (average 12·4 m) above ground on fork of horizontal branch overhanging area clear of vegetation; wide variety of trees used, such as mango, mbarabai (*Grisollea myrianthea*), sang dragon (*Pterocarpus indicus*), ylang-ylang, African tuliptree (*Spathodea campanulata*); average territory size at Combani 2·4 ha in natural mixed humid forest, 9·6 ha in surrounding semi-wooded areas with agricultural fields. Clutch 1–3 eggs (average 2·3), pinkish-cream, spotted with rufous on underlying purplish-grey, mainly at top of large end, c. 20 × 27 mm; if first attempt unsuccessful, will build new nest in different location and lay replacement clutch; incubation by both sexes, one incubating partner reported as feeding the other on occasion, period 19–21 days; nestling period 17–22 days; fledglings continue to be fed outside nest by both parents for at least one month, and remain with parents until start of next breeding season. Normally 2–3 fledglings per brood (average of 16 broods 2·1); calculated failure of individual nests as high as 75%, resulting mainly from high predation levels at either egg stage (hatching success 53 %) or chick stage (fledgling success 46%); percentage of pairs successful varies from year to year, e.g. during 2002–2003 season average productivity 1·4 fledglings per pair for sample of ten pairs, 70% of which had succeeded in raising chicks by end of season.

Movements. Resident.

Status and Conservation. ENDANGERED. Recent population estimate suggests species should be downgraded to Vulnerable. Restricted-range species: present in Comoro Islands EBA. Confined to island of Mayotte (surface area 374 km²), where present only on Grande Terre (absent from Petite Terre and other islets); the only drongo on Mayotte. Global numbers earlier underestimated at c. 100 individuals; research in 2002–2004, based on point counts and density measurements (e.g. 42·4 and 10·4 pairs/100 ha, respectively, in forest and semi-cultivated area), reassessed population size at minimum of 2500 pairs. Commonly found above 200 m around the four mountains that retain large expanses of humid natural forests in N & C of the island (Hachiroungou, Mtsapéré, Combani and Bénara), and also at lower altitude along W coast (in Sohoa forest). Occurs also, at low density, in areas of degraded habitats between mountains, and in some mangroves in NE (Dzoumonyé-Bouyouni), SW (Miréréni-Chirongui) and W (Tsingoni-Mroale-Soulou) of the island. Absent from entire S peninsula (Mt Choungui and the lowland dry forests of Dapani-Sazilé). Has suffered from continuing decline in both extent and quality of natural habitat over past decades; 6000 ha of forest (25% of the island's total) disappeared between 1949 and 2002. A network of forest reserves totalling c. 4770 ha and covering all remaining natural forests has been established, but steady human population growth on Mayotte has led to illegal clearance for cultivation of food crops and timber, and this remains a major threat to this species' future survival. Introduction of new nest predators, e.g. mongooses (*Herpestes*), monkeys, snakes and lizards, represents potentially a very serious threat. This species should continue to be monitored, and be used as a flagship for environmental programmes designed to increase the human population's awareness of the need to preserve the forests. More detailed studies on its population ecology and dynamics also desirable.

Bibliography. Anon. (2003a, 2008i), Benson (1960), Butchart & Stattersfield (2004), Collar & Stuart (1985), Huguet & Chappuis (2003), Louette (1999), Pasquet *et al.* (2007), Rocamora (2003, 2004, 2008), Safford & Evans (1992), Stattersfield & Capper (2000), Stevens & Louette (1999), Vaurie (1949).

25. Madagascar Crested Drongo

Dicrurus forficatus

French: Drongo malgache **German**: Madagaskardrongo **Spanish**: Drongo Malgache
Other common names: Crested Drongo

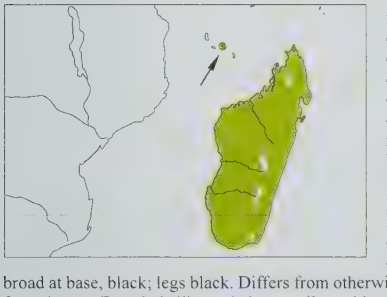
Taxonomy. *Lanius forficatus* Linnaeus, 1766, south-east Madagascar.

Recent DNA studies indicate that this species' closest relative is *D. aldabranus*, following colonization of Aldabra from Madagascar less than 125,000 years ago, and also that it is more closely related to *D. waldenii* than to the older *D. fuscipennis*; all were previously thought to be part of a superspecies that contained also *D. macrocercus*, *D. adsimilis* and *D. modestus*, but morphological and genetic differentiation too great to support such a relationship. Two subspecies recognized.

Subspecies and Distribution.

D. f. potior (Bangs & T. E. Penard, 1922) – Anjouan (Ndzuani), in C Comoro Is.

D. f. forficatus (Linnaeus, 1766) – Madagascar and some larger inshore islands, including Nosy Bé, Nosy Komba and Nosy Boraha (I Sainte Marie).



Descriptive notes. Male 26–30·5 cm and female 18–24·5 cm (nominate), male 28·5–31·5 cm and two females 25 cm and 27·5 cm (*potior*); 39–55 g. Rather large, long-tailed drongo with strong, broad-based bill, tuft of elongated frontal feathers (20–40 mm) at base of bill forming slightly curving crest. Male nominate race has uniformly deep lustrous black plumage glossed with steely dark greenish-blue, primaries brownish-black when plumage worn; tail long (120–140 mm) and moderately forked (depth of fork 25–48 mm), outer rectrices curved outwards; iris dark reddish-brown or crimson-red; bill strong and broad at base, black; legs black. Differs from otherwise almost identical *D. adsimilis* in presence of frontal crest. Female is like male but smaller, with plumage browner and much less glossy. Immature has dark brown plumage, less glossy than adult, mixed with whitish on head, nape and neck, barred whitish or buff on underparts, and dotted with small white feathers on inner bend of wing, also has shorter and less forked tail, little or no crest, iris initially brown. Races differ only in size: *potior* is larger than nominate, with considerably heavier and longer bill, longer tail (143–153 mm) deeply forked (39–46 mm), also immature said to have varying tendency towards non-glossy black abdomen and undertail-coverts. Voice. Very vocal and noisy, with extensive repertoire. Loud calls and whistles, as well as softer whistled calls, given on Madagascar, with sometimes a 3-note monotonous "twee-too-hee", "t-seee-churr-chirr" or "kák-kák" jerky calls; also a harsh "kék" when mobbing human intruders. Song consists of succession of short strophes, such as double fluty notes or trisyllabic nasal and grinding sounds, repeated 5–10 times, developing into very rapid jingle of nasal chirps and sharp squeaks. Anjouan birds (race *potior*) reported as giving harsh "kwee-u", repeated at intervals of c. 5 seconds, and a single "quok"; found to have very similar repertoire to that of nominate race on Madagascar. Often imitates calls and songs of other birds, including Madagascar Coucal (*Centropus toulou*), Madagascar Black Bulbul (*Hypsipetes madagascariensis*), Common Myna (*Acridotheres tristis*) and Frances's Sparrowhawk (*Accipiter francesii*) in Madagascar, and even domestic animals such as cats or chickens around villages.

Habitat. Present in all wooded habitats, even with few scattered trees, from sea-level to 1875 m in Madagascar; in highlands, above 1000 m, largely restricted to natural forests. Found in all types of both primary and secondary forest (including riverine, humid, dry and spiny forests), degraded woodland and regrowth following exploitation, also in plantations of e.g. pine (*Pinus*), eucalypts (*Eucalyptus*), sisal (*Agave sisalana*), orchards, clearings with sparse trees in cattle-farming and agricultural areas, also gardens in villages and urban residential areas; particularly fond of clearings and forest edges, also perching on roofs and fences, rarely flying over large distances. Occupies similar habitats on Anjouan, including more open parts of evergreen forest above 700 m, cultivated areas with large trees, and coconut (*Cocos nucifera*) plantations.

Food and Feeding. Invertebrates, some small vertebrates; fruits. Stomach contents from Madagascar include spiders (Araneae), beetles (of families Cerambycidae, Curculionidae, Elateridae, Scarabaeidae, Tenebrionidae), robber-flies (Asilidae), grasshoppers and locusts (Orthoptera), wasps (Hymenoptera), cicadas (Cicadidae) and dragonflies (Odonata); feeds also on vertebrates such as small chameleons (Chamaeleonidae). Stomach contents from Anjouan comprised mainly insects, including beetles and to lesser extent grasshoppers and caterpillars, as well as spiders and, in one case, fruit remains. Reported as eating fruits of arofy tree (*Commiphora guillaumini*), and probably dispersing its seeds in dry forests of W Madagascar. Hunts mostly in middle and upper canopy. Frequently seen on prominent perch, from which it sallies out to capture large insects on the wing, coming back to same perch. Often flies slowly, gliding from branch and swooping up to perch, but capable of slaloming between vegetation stands and performing aerial acrobatics on occasion. After a capture, often gives short song, raises crest and flicks tail while holding prey in bill; grasps large food item with its foot, dismembering it with the bill and eating it piecemeal; large body parts of prey may be well mandibulated before being swallowed. Usually solitary, in pairs or in small family groups. In Madagascar, joins mixed-species flocks of insectivorous birds such as cuckoo-shrikes (*Coracina*), bulbuls (Pycnonotidae), tetrakas (*Bernieria*, *Xanthomixis*), paradise-flycatchers (*Terpsiphone*), sunbirds (*Nectarinia*), newtonias (*Newtonia*), white-eyes (*Zosterops*) and vangas (Vangidae), catching prey disturbed by these, and giving alarm when predators detected. In dry forests of W Madagascar, a regular member of mixed flocks (with up to 17 species) and the one exhibiting the most contrasted changes in hunting techniques: when foraging with other species, snatches or gleans vegetation or ground below 6 m to capture large slow-moving arthropods e.g. Lepidoptera larvae, Coleoptera, Orthoptera, arachnids, millipedes (Diplopoda); when hunting alone, sallies to catch small flying insects (e.g. Diptera) in air above 6 m. Benefits greatly from association with mixed flock, having feeding rates higher than when hunting alone; joins such flocks twice as frequently during non-breeding season than in breeding season. Occasionally steals food from other birds.

Breeding. Laying in Sept–Dec (likely peak Oct–Nov) in most of Madagascar, and Oct to early Feb in SE dry areas; two males with enlarged testes in Sept on Anjouan; one brood per year. Following details refer to nominate race (Madagascar); no information for race *potior* (Anjouan). Monogamous; report of males fighting over one female. Aggressively territorial; pair will vigorously drive out conspecifics entering territory, and will harass and relentlessly chase any other animal coming too close to nest, including raptors such as Frances's Sparrowhawk, Madagascar Serpent-eagle (*Eutriorchis astur*) and the huge Madagascar Fish-eagle (*Haliaeetus vociferoides*), and other large birds e.g. Pied Crow (*Corvus albus*), Hook-billed Vanga (*Vanga curvirostris*), Cinnamon Roller (*Eurystomus glaucurus*) and Cuckoo-roller (*Leptosomus discolor*), and also lemurs (Lemuriformes), cows, dogs and even humans. Nest built by both sexes, a small and shallow cup in which adult barely fits (looking as if perched on top, rather than sitting in cup), two nests had external diameter 11·5–12 cm, depth 6 cm, internal diameter 8 cm, depth 4–4·5 cm, coarsely made from intertwined fine vegetable fibres, including herbaceous stems, grasses, leaf stems or rootlets, bound together with spider webs, lined with grasses, coarse fibres or small dried branches, suspended from horizontal fork 2·5–14 m above ground at extremity of tree branch, sometimes in flat crotch or between main trunk and horizontal branch, at forest edge, above open area or stream in forest, or in lower branch of large tree in gallery forest or in mango (*Mangifera*) grove. Clutch 2–4 eggs, generally 3, white to salmon-pink, with light lilac blotches and reddish-brown and greyish spots, more numerous and blurred at larger end, 24·4–26 × 17·6–18·4 mm; incubation by both sexes, male seen to offer prey to incubating female; chicks fed by both parents; no information on duration of incubation and nestling periods; fledglings fed by both parents, period of dependence not documented.

Movements. Resident.

Status and Conservation. Not globally threatened. Nominate race rather common in most wooded regions of Madagascar except in highlands, where rarer above 1000 m (uncommon at Montagne d'Ambre; unrecorded from several forest surveys above 1260 m), and sometimes restricted to natural forests. Second commonest large passerine after Madagascar Black Bulbul at Anjanaharibe-sud (875 m), with density of 66 birds/100 ha. Formerly reported also from islets of Nosy Tanikely and Nosy Faly, both near Nosy Bé. No signs of population decline in Madagascar, where tolerant of habitat degradation; present in all man-made rural habitats and may even have benefited from human activities. Easily observed at low or middle altitudes in many reserves and national parks across Madagascar, e.g. Ankarafantsika, Andasibe-Mantadia, Ranomafana, Kirindy and Andohahela National Parks, Lokobe (Nosy Bé), Ankarana and Anjanaharibe-sud Special Reserves, Tsingy Bemaraha Strict Nature Reserve and Berenty Private Reserve. Known to host a blood parasite responsible for avian malaria (*Haemaproteus dicruri*), but this probably not a threat to the species' future survival. Anjouan race *potior* considered in 1958 to be fairly common in more open parts of evergreen forest above 700 m; in N of island, scarcer in cultivated areas, and not very common but widely distributed in forested areas down to sea-level (at Bambao and Dzindri). Little more recent information available from Anjouan, where generally considered uncommon to rare, and possibly at risk owing to small population size with low densities and its restriction to a small island (424 km²).

Bibliography. Benson (1960), Benson *et al.* (1977), Böhning-Gaese *et al.* (1996), Goodman & Parillo (1997), Goodman, Pidgeon *et al.* (1997), Goodman, Rakotondravony *et al.* (2000), Hawkins & Goodman (1999), Hawkins, Thiollay & Goodman (1998), Hino (1998), Huguet & Chappuis (2003), Langrand (1995), Louette (1988, 2004), Milne-Edwards & Grandidier (1879), Milon *et al.* (1973), Newton (1863, 1877), Pasquet *et al.* (2007), Rand (1936), Ravokatra *et al.* (2003), Safford & Hawkins (2009), Salvan (1970), Savage & Grainer (2005), Schlegel & Pollen (1868), van Someren (1947), Vaurie (1949).

26. Aldabra Drongo

Dicrurus aldabranus

French: Drongo d'Aldabra **German**: Aldabradrongo **Spanish**: Drongo de Aldabra

Taxonomy. *Buchanga aldabrana* Ridgway, 1893, Aldabra Atoll, Seychelles.
Recent DNA studies indicate that this species' closest relative is *D. forficatus*, its likely origin following colonization of Aldabra less than 125,000 years ago (after the atoll's last submersion); both were previously thought to be part of a superspecies with *D. fuscipennis*, *D. macrocercus*, *D. adsimilis*, *D. modestus* and *D. waldenii*, but morphological and genetic differentiation too great to support such a relationship. Monotypic.
Distribution. Aldabra Atoll, in SW Seychelles.



Descriptive notes. 23 cm; 40–53 g. Plumage is entirely deep lustrous black with dark dull greenish-blue gloss, duller on flight-feathers and tail; long frontal feathers curving forwards and slightly upwards; tail long (128–145 mm) and moderately forked (depth of fork 26–35 mm), black in fresh plumage but browner when worn, outer rectrices curving slightly outwards at distal end; long nasal/frontal feathers; iris red; bill very strong and slightly hooked, black; legs black. Differs from relatively similar *D. forficatus* in having reduced frontal crest. Sexes alike, male tending to have longer bill tuft. Immature is distinctive, grey-brown above, with white uppertail-coverts, white-edged wing-coverts and secondaries, and most feathers with buffy terminal edges, almost completely white below with irregular amounts of buffy or brownish-grey, iris brown, also has shorter wing, shorter and less forked tail than adult. Voice. Very vocal and noisy, with very varied repertoire of calls and short phrases combining nasal and metallic squawks, melodious whistles and fluty notes, scolding chatters, harsh chuckling sounds and scratchy cries. Often sings from songpost, mainly after dawn or during early morning. During breeding season, male and female sing together in sort of duet in vicinity of nest; also exchange soft whistling and muttered calls at nest-building stage, possibly as part of courtship. Nasal and wheezy contact calls include "oink-eugh" or "eenk-yawk", and in flight high-pitched "eugh-eugh-eugh". Harsh nasal "chirrr", and alarm call of 3 musical whistles followed by 2 nasal harsh notes, "ti-ti-you caw caw" or "ti-ti-po fa fa", repeated rapidly and continuously when driving intruder from nest; after successful chase, "fa-wip" repeated several times from a branch. Distress calls reported when nest approached. Scolding chatters, reminiscent of alarm call of extinct Aldabra Brush-warbler (*Nesillas aldabrana*), possibly by juveniles begging for food.
Habitat. Present in the three main wooded habitats on Aldabra atoll (maximum elevation 17 m), i.e. dense scrub, *Casuarina equisetifolia* coastal forest, and mangroves; breeds preferentially in the two last, where taller trees probably provide better nesting sites. Uncommon or absent in open mixed scrub at E side of Grande Terre.
Food and Feeding. Mainly insects, also small vertebrates such as geckos (Gekkonidae) and lizards. Insects include beetles (of families Curculionidae, Carabidae and others), both winged and unwinged ants (Formicidae), cicadas (Cicadidae) and other homopteran bugs, grasshoppers (Orthoptera), various heteropteran bugs, and Hymenoptera (including sphecid wasps). Perches in very upright posture, tail hanging vertically below. Hawks insects on the wing while gliding from observation post, pursuing and slaloming between stands of vegetation or flycatching; flight very undulating. Prey also captured on branch or trunk of tree, by "perch-and-pounce" technique. Sometimes feeds on ground-dwelling prey; this applies especially to juveniles having not yet acquired good aerial hunting skills. Prey normally caught with the bill, occasionally with the claws. Often associates with foraging Madagascar Coucals (*Centropus toulou*), capturing insects displaced or uncovered by the latter (a relationship that may involve some form of parasitism); also with resting Aldabra giant tortoises (*Dipsochelys dussumieri*), catching flying insects attracted by their presence or their dung. Observed hunting at dusk, and also at night around artificial lights and over beach sand (where insects more easily spotted during daytime or dusk).
Breeding. Recorded mid-Sept to Nov (first nests built) and Mar–May (last fledglings), depending on year; brood-feeding coinciding with main rainy season (Dec–Mar); first laying normally Nov–Dec, clutches in Jan–Feb corresponding to replacements; one successful brood raised per year. Territorial, with stable and very precise territory boundaries throughout breeding season; extremely aggressive, driving out all intruders by mobbing, "dive-bombing", pecking at and pursuing large creatures such as crows (*Corvus*) or even humans, as well as other animals approaching too close to nest, these ranging from herons (Ardeidae), frigatebirds (*Fregata*) and boobies (*Sula*) to coucals (*Centropus*), turtle-doves (*Streptopelia*), falcons (*Falco*), bulbuls (*Hypsipetes*), terns (*Sterna*) and fodies (*Foudia*), and including migrant falcons and rollers (*Coracias*), and even fruit-bats (*Pteropus*); one bulbul reported as having been fiercely pecked at and knocked down by the drongo. In courtship, partners face each other, bills held slightly above horizontal, shaking wings vigorously and wagging tail from side to side, while uttering soft high-pitched squeaky sounds; one bird (presumed male) may pick a leaf and offer it to partner. Nest normally built by both sexes within 10–20 days, unfinished nest sometimes abandoned in event of human disturbance; a perfectly rounded cup made from intertwined fine vegetable fibres e.g. casuarina needles, wood-rush (*Luzula*) or dry monocotyledon grass leaves, bound with cobweb, nest thicker on sides and more thinly constructed at base (through which contents often visible), one nest 13 cm across and 5 cm deep externally, 8 cm across and 2 cm deep internally; generally woven in fork towards end of thin horizontal branch 2–8 m (exceptionally to 13 m) above ground, preferably in taller tree such as casuarina or mangrove tree (e.g. *Rhizophora mucronata*), also on smaller native tree e.g. fig (*Ficus*), or in *Premna serratifolia*, *Euphorbia pyrifolia* or *Mystroxylon aethiopicum* in lowland scrub habitat; average territory size 2·25 ha in casuarina woodland (on Picard), 4·5 ha in mixed scrub (Malabar; Passe Hoareau). Clutch 1–3 eggs (average 2·1), decreasing through breeding season, white to pale flesh-coloured, with dark red spots more concentrated at larger end, average of two eggs 26·2 × 19·2 mm; if contents lost, up to five replacement clutches laid (normally builds new nest at different site predation, occasionally uses same nest); incubation and chick-feeding by both parents, incubation period 16–18 days, nestling period 15–19 days; juveniles dependent for at least several weeks after fledging, remain with parents until following breeding season, then chased by parents but still tolerated at territory periphery, which they defend against neighbouring conspecifics. Breeding success appears very low owing to extremely high proportion of clutches (73% of eleven clutches in 1999/2000) suffering predation, mainly by Pied Crows (*Corvus albus*) and rats (*Rattus*), and probably Madagascar Coucals (*Centropus toulou*), herons (*Ardea*, *Butorides*) and Madagascar Bulbuls (*Hypsipetes madagascariensis*), as observed or suggested in artificial nest experiments; feral cats and Madagascar Kestrels (*Falco newtoni*) also suspected of taking chicks; annual productivity low, less than 20% of 14 pairs successful in rearing young on Malabar during 1976/77 season (0·6 fledglings per pair), and on Picard similar values in 1999/2000 (only two of ten pairs successful, 0·4 fledglings per pair) and in 2000/2001, with hatching success 29% and fledging success for hatchlings of 80% over the two seasons; only 23% of eggs laid produced a fledgling; successful nests produce up to three fledglings, but normally only one or two (average 1·6). First breeding not until at least 2 years.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Aldabra EBA. Nowhere abundant, and very uncommon in open mixed scrub at E end. Confined to the four main islands of Aldabra Atoll (Grande Terre, Malabar, Polymnie, Picard) and some of their neighbouring islets, including larger lagoon islands of Esprit (where breeding reported), Moustique, I aux Cèdres, Gros Ilot and Michel. Tiny global range (154 km²) and small population size of c. 1500 individuals, putting it at risk from catastrophic events, such as disease and cyclones. No apparent decline in numbers reported. As Aldabra is a nature reserve, as well as a World Heritage Site, the species' habitat is adequately protected. High nest-predation rates may limit population size, and could be significantly reduced if introduced rats and cats were eradicated; strict control of organic waste required around settlement and camps, to prevent Pied Crow numbers increasing.
Bibliography. Anon. (2008i), Benson (1967, 1984d), Bergeson (1996), Butchart & Stattersfield (2004), Collar & Stuart (1985), François & Fanchette (2003), Frith (1977), Pasquet *et al.* (2007), Penny (1974), Prys-Jones, O.E. & Prys-Jones (undated), Prys-Jones, R.P. & Diamond (1984), Ridgway (1893, 1895), Rocamora & Jules (2000), Rocamora & Skerrett (2001), Skerrett *et al.* (2001), Stattersfield & Capper (2000), Threadgold & Johnson (1999), Vaurie (1949).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family CALLAEIDAE (NEW ZEALAND WATTLEBIRDS)



- Medium-sized to large passerines with short rounded wings, relatively long tail, sturdy legs with unusually long tarsus, distinctive orange or blue fleshy wattle below gape, and robust bill; plumage blue, or black and reddish-brown.
- 25–38 cm.



- New Zealand.
- Forest, now mostly regenerating forests on offshore islands.
- 2 genera, 3 species, 3 taxa.
- 1 species threatened; 2 species extinct since 1600.

Systematics

A small but morphologically plastic family of medium-sized to large passerines, Callaeidae is confined to the three main islands of New Zealand and its near offshore islands. Increasingly, evidence is suggesting that this family is part of an ancient radiation of birds in New Zealand that probably took place via Australia in the early Tertiary, as has been shown by the investigations of J. G. Ewen and co-workers. There are three extant species, namely the South Island Saddleback (*Philesturnus carunculatus*), the North Island Saddleback (*Philesturnus rufusater*) and the North Island Kokako (*Callaeas wilsoni*). Two further species, the South Island Kokako (*Callaeas cinereus*) and the Huia (*Heteralocha acutirostris*), are now extinct.

The species-level taxonomy is currently in a state of flux. Some ornithologists consider that the two saddlebacks are better treated as conspecific, and the two kokako are likewise often regarded as subspecies of a single species. There are good reasons, however, for recognizing two species in each of the two genera *Callaeas* and *Philesturnus*. In *Callaeas* this treatment reflects not only the phylogenetic divergence between the two kokako suggested by the results of the genetic studies of S. A. Murphy and colleagues in 2006, but also marked differences in wattle colour, minor differences in plumage, statistically significant differences in morphometrics and, moreover, documented differences in behaviour that may have led to the extinction of the South Island taxon. Although little has been written about the vocalizations of the South Island Kokako, the few details that were published, in the last two decades of the nineteenth century, do, again, suggest significant differences. The recognition of two species of kokako was the preferred treatment of W. R. B. Oliver in 1955 and also, half a century later, of R. N. Holdaway and colleagues, T. H. Worthy and Holdaway, and A. J. D. Tennyson and P. Martinson.

With the two saddlebacks, there are statistically significant differences in morphometrics and well-documented differences in breeding biology, behaviour and vocalizations between the North Island population and the South Island population. It seems likely that these two, because of their phylogeographical isolation, would have undergone genetic divergence similar to that of the two *Callaeas* taxa. In the case of the saddlebacks, however, the most significant feature supporting the recognition of two species is the juvenile plumage that is present only in the South Island Saddleback. Treatment of the saddleback taxa as representing two full species is considered appropriate and was the preferred option of Worthy and Holdaway in 2002.

The taxonomic affinities of the family have been subject to a great deal of debate. In 1872, A. H. Garrod suggested that the Huia was related to the New World blackbirds (Icteridae) and to the starlings (Sturnidae). Five years thereafter, R. B. Sharpe placed



Callaeidae is a distinctive family, confined to New Zealand. It is herein considered to contain five species in three genera: two species of kokako (Callaeas), *one of them extinct; two of saddleback* (Philesturnus); *and the extinct Huia* (Heteralocha acutirostris). *Some taxonomists consider that saddlebacks and kokako should each be regarded as single species each with two races. Notwithstanding this, differences long noted between the* ***North Island Kokako*** *and its South Island counterpart in both bare-part coloration and behaviour have now been backed up by the results of phylogenetic studies.*

[*Callaeas wilsoni*, Otorohanga Breeding Centre, North Island, New Zealand. Photo: Mark Jones/Roving Tortoise Photos]



The two saddleback species are around 25 cm in length. In the ***North Island Saddleback*** *average weight is about 80 g in males and 70 g in females, while the South Island Saddleback* (Philesturnus carunculatus) *averages slightly heavier. Saddlebacks show a strong, slightly downcurved bill, a long tail with rounded tips and a distinctive downward curve, and short, rounded wings. The plumage is mostly glossy black, with a prominent dark orange or red-brown "saddle" from the mantle to the rump. A small pendulous reddish wattle extends from the gape down to the throat. The sexes are alike in plumage, although the wattle, which increases in size, colour intensity and fleshiness in the breeding season, is larger in the male.*

[*Philesturnus rufusater*. Photo: Paddy Ryan]

the New Zealand wattlebirds in his enlarged family Corvidae, positioned between the genus *Picathartes* (Picathartidae) and the vanga genus *Falculea* (Vangidae). C. R. Stonor, in 1942, concluded that *Callaeas*, *Philesturnus* and *Heteralocha* belong in a single group. He accepted Garrod's supposed evidence for the affinity of *Heteralocha* with the Sturnidae, but it would appear that this opinion was due to Stonor's misreading of Garrod's intentions. At that time, Garrod included Icteridae within Sturnidae, and he found that icterid and sturnid skulls were morphologically similar to that of the Huia; the primary similarity which Garrod found, however, was that all three had a large M. depressor mandibulae, the primary jaw-opening muscle of birds, which is simply an adaptation for using a long bill that can be opened forcibly against resistance. For this reason, as well as the group's restricted New Zealand distribution, its very long legs, and its short rounded wing with a large tenth primary, D. Amadon, in 1943, rejected the hypothesis that Callaeidae was allied with Icteridae or Sturnidae. He preferred the idea that the New Zealand wattlebirds, sometimes referred to as "wattled crows", belonged to a group of related families that included Corvidae, the drongos (Dicruridae), the butcherbirds (Cracticidae), the birds-of-paradise (Paradisaeidae), the Old World orioles (Oriolidae), and others. Later, however, Amadon clearly changed his mind, as E. Mayr and Amadon, in their 1951 classification, placed the New Zealand wattlebirds between Grallinidae, which at that time contained the Australian species the Magpie Lark (*Grallina cyanoleuca*), the White-winged Chough (*Corcorax melanoramphos*) and the Apostlebird (*Struthidea cinerea*), and Cracticidae, consisting of the butcherbirds and allies. *Corcorax* and *Struthidea* are now treated in a separate family, Struthideidae. A few years later, Oliver, in his work *New Zealand Birds*, combined the saddlebacks and the Huia in a family Philesturnidae, but placed the kokako in a separate but closely allied family, "Callaeadidae".

More recently, C. G. Sibley and J. E. Ahlquist conducted extensive analyses, using the technique of DNA–DNA hybridization, in an innovative attempt to elucidae the interrelationships of birds. Unfortunately, they lacked DNA samples of the three New Zealand wattlebird species and were, therefore, unable to study the possible relationships of the Callaeidae with other passerines; consequently, these authors combined them as one family, which they placed after their greatly expanded family Corvidae and immediately preceding the Picathartidae.

A novel recent hypothesis regarding the systematic position of Callaeidae, proposed by F. K. Barker and colleagues in 2004, was that it grouped with the berrypeckers (Melanocharitidae) and the two satinbird genera *Cnemophilus* and *Loboparadisea*. The last two taxa are currently treated as a subfamily, Cnemophilinae, within Paradisaeidae, but are considered by some researchers to have no close affinities with this group. J. Cracraft and co-workers, in 2004, and L. D. Shepherd and D. M. Lambert, in 2007, supported this new arrangement and suggested that Callaeidae, along with Melanocharitidae and the cnemophilines, were basal members of the "parvorder" Corvida as defined by Sibley and Ahlquist, giving evidence for an origin of the oscine radiation in Australia and Antarctica. Ewen and colleagues, however, have suggested that both Callaeidae and the newly described monotypic family Notiomystidae, the latter containing the Stitchbird (*Notiomystis cincta*), are part of a largely unresolved polytomy that also includes essentially all groups of oscine passerines except the most basal lineages. They consider this New Zealand lineage as not part of the "core Corvoidea", as defined by Barker and co-workers in 2004, nor of the parvorder Passerida, as defined by P. G. P. Ericson and U. S. Johansson in 2003. A further indication that these New Zealand endemics are not part of the Passerida radiation is that neither Callaeidae nor Notiomystidae possesses an insertion in the c-myc gene, which is proposed as being a synapomorphy for this clade.

It should be noted, however, that a recent analysis of various combined data sets, undertaken by M. Irestedt and J. I. Ohlson, revealed that the phylogenetic positions for Callaeidae, Cnemophilinae and Melanocharitidae were largely dependent on which genes were combined. In this analysis, a consensus found reasonable support for a Passerida affinity of Callaeidae and the cnemophilines, contrary to previous molecular studies.

Rather remarkably in such a small family, there are two significant issues affecting nomenclature. The earliest family-group name applicable to these birds was "Callaeadides", as proposed by C. J. Sundevall in 1836, but already by the 1840s G. R. Gray was using the form "Callaeatinae"; subsequently, over the last century or so, most workers have used the form "Callaeidae". As the genus name *Callaeas* is a Latinized Greek word with an altered ending, the International Code of Zoological Nomenclature requires that its stem be formed based on the genitive of the corresponding Latinized word. There appear to be no linguistic grounds supporting use of the forms "Callaeadidae" or





*Juveniles of the **South Island Saddleback** are very different from the adults. In place of the latter's glossy black plumage and reddish-brown "saddle", the juveniles have dark brown plumage with a chestnut wash on the head and rump, and a small, pink wattle, as well, initially, as a yellowish gape-line. This distinctive appearance has given rise to a separate local name, "jackbird", for this age-group. The immature South Island Saddleback is similar to the juvenile, but with increasing amounts of black on its body feathers, although it retains the brown juvenile rectrices and remiges. The wattles become increasingly reddish-orange, and slowly grow in size. In marked contrast, the plumage of the juvenile **North Island Saddleback** differs only slightly from its adult in being mostly brownish-black, not glossy black. As in the South Island species, juveniles initially have a yellowish gape-line, and the wattles are small and pink to begin with, becoming increasingly reddish-orange as they grow. All members of Callaeidae acquire adult plumage when they are about one year old. They then undergo a complete post-breeding moult during each annual cycle, which produces successive adult plumages with no perceptible change in appearance. In all members of Callaeidae, extant and extinct, there are ten primaries, the outermost of which is comparatively long, and nine secondaries, including three tertials. The tail is long, and rounded at the tip; it contains twelve rectrices. During moult, the primaries are shed outwards, starting at the innermost primary, and up to three new primaries can be growing simultaneously.*

[Above: *Philesturnus carunculatus*, Stewart Island, New Zealand. Photo: Steffan Oscarsson.

Below: *Philesturnus rufusater*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Peter Ryan]

"Callaeatidae", though perhaps a case could conceivably be argued for the hitherto-unused "Callaeantidae". Nevertheless, an equally good and probably better linguistic case can be made for the form "Callaeidae", and as this has been the most widely used name for the group, all the weight of the Code supports the continued use of this name.

The other major debate concerns the generic name of the saddlebacks. They have long been considered to merit a genus of their own, but there has been disagreement as to whether the correct genus is *Creadion* or *Philesturnus*. The name *Creadion* was established in 1816 by L. J. P. Vieillot, 16 years prior to I. Geoffroy Saint-Hilaire's *Philesturnus*, so there is no issue as to which of the names is older but rather as to whether or not the older name can properly be applied to the saddlebacks. Vieillot's original description included three species in his new genus, but subdivided them into two sections; he did not specify a type species. All three are still informally known as "wattlebirds" but, while the saddlebacks belong to the New Zealand family Callaeidae, the other two species are Australian wattlebirds, nowadays placed in the honeyeater family Meliphagidae. In 1827, N. A. Vigors and T. Horsfield, recognizing that the species could not all suitably be included in the same genus, erected the genus *Anthochaera* for the Australian birds, leaving the New Zealand ones to represent *Creadion*. However, the validity of this as a formal designation has been disputed, and confusion has arisen from a subsequent action of R. P. Lesson in 1837 restricting *Creadion* to the Australian wattlebirds. Due to these disagreements and the subsequent use, albeit limited, of this name for one or other group by different authors, the valid genus name for the saddlebacks is still under dispute, awaiting a clear demonstration one way or the other.

All three extant callaeids produce melodious piping or organ-like sounds, and also some flute-like vocalizations. The ***North Island Kokako*** *has one of the most haunting and beautiful songs of any forest passerine. It is the principal means of locating this shy, cryptically coloured bird. The song, given throughout year but mainly in late spring and summer, is a loud 30-second sequence of rich, slow, organ-like notes, produced by both sexes, sometimes in duet. Singing begins at sunrise, and continues for some 60–90 minutes. Apart from quiet social and contact calls, the bird is usually silent for the rest of the day.*

[*Callaeas wilsoni*, Otorohanga Breeding Centre, North Island, New Zealand. Photo: Mark Jones/Roving Tortoise Photos]



Morphological Aspects

The three New Zealand wattlebirds are medium-sized passerines, ranging in size from the two saddlebacks, 25 cm in length and weighing about 90–90 g, to the North Island Kokako, which is 38 cm long and weighs 200–250 g. The extinct Huia was the largest member of the family, measuring approximately 53 cm and weighing as much as 400 g or thereabouts.

These are rather attractive passerines, with plumage that varies significantly among members of the family. The kokako has the body mostly bluish-grey, whereas the saddlebacks have the base colour black but with a distinct reddish-brown to dark orange band across the upperparts; the bill, legs and feet are dark grey. The Huia was of an iridescent black, with a broad white tip on the tail, and had a pale horn bill and black feet. In all members of the family the sexes are alike in plumage. Juveniles of the North Island Kokako and of the North Island Saddleback superficially resemble the adults, but the feathers are softer and the barbs are less tightly held together, giving the plumage a soft feel and

The song of the ***South Island Saddleback*** *is heard throughout the year, and throughout the day. A loud repetitive chattering, it is given by both sexes. Although this song is indeed noisy and boisterous, it is less so than that of the North Island Saddleback* (Philesturnus rufusater). *In all three wattlebirds, components of the song can be categorized into local dialects, which may allow information about the relationships between neighbours to be expressed. Neighbouring and related saddlebacks are likely to have similar songs. In all three species, individuals countersing with their territorial neighbours and respond strongly to imitation or playback of their songs.*

[*Philesturnus carunculatus*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Tui de Roy/Roving Tortoise Photos]





All the New Zealand wattlebirds are omnivorous, but the main components of the diet vary among the species, and this is reflected in the morphology of their bills. The long, slightly decurved bills of the saddlebacks are used to forage for insects by probing, tearing and gleaning. The ***South Island Saddleback****, for example, uses its bill to pick insects off the surfaces of leaves. The bill of a foraging saddleback is held either open or closed, and the upper mandible is sometimes used as a skewer. Saddlebacks have large depressor mandibulae muscles, which enable the bill to be opened forcibly against resistance. By pushing the bill into the soil and then opening the mandibles, or "gaping", the saddleback makes an enlarged hole so that prey is easier to find and extract. In the extinct Huia* (Heteralocha acutirostris)*, the male's short, powerful, slightly decurved bill was used to break up wood; its well-developed cranial musculature also facilitated gaping. By contrast, the female Huia's long, slender, sickle-shaped bill was used for probing holes and crevices. The kokako* (Callaeas)*, with their more robust bills, show no adaptations for gaping. Saddlebacks may vary their diet seasonally, especially in late summer, when berries are available. They forage at all levels of the forest, in the leaf litter, on decaying timber, and among branches and foliage right up to the canopy. Studies of North Island Saddlebacks* (Philesturnus rufusater) *indicate that foraging heights vary seasonally, with more time spent on the ground in winter, and more spent foraging for fruits in late summer and autumn. Males and females may exploit different heights when foraging together, with males more frequently on the ground.*

[*Philesturnus carunculatus*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Tui de Roy/Roving Tortoise Photos]





*This **South Island Saddleback** is investigating the fissured and scaly bark of a tree-fern. Both saddleback species probe under and tear off chunks of bark or wood, attempting to expose the invertebrates beneath. They grasp the bark with the bill, and use their own weight to pull it away. They also probe in and around the decaying wood of branches, stumps and fallen logs. When foraging on the ground, they lift leaves and moss, and may toss leaf litter in the manner of a* Turdus *thrush. All three extant wattlebirds hold their food with their feet, in the manner of a parrot. The better-studied North Island Saddleback* (Philesturnus rufusater) *has been observed using its bill to give sharp jabs to larger prey before dismembering it.*

[*Philesturnus carunculatus*, Ulva Island Bird Sanctuary, Stewart Island, New Zealand. Photos: Tui de Roy/ Roving Tortoise Photos]

producing a scruffier appearance. The South Island Saddleback, in contrast, has a uniformly brown juvenile plumage, giving individuals of this age the name of "jackbird".

Kokako hatch with well-developed natal down, while saddlebacks are naked at this stage. Callaeids undergo a partial post-juvenile, or first pre-basic, moult to a superficially adult-like first immature, or first basic, plumage, except that the South Island Saddleback has a distinctive uniformly brown first immature plumage. All members of the family acquire adult plumage through a complete first immature post-breeding, or second pre-basic, moult, probably when they are about one year old. After acquiring this adult plumage, they have a complete post-breeding moult during each annual cycle, which produces successive adult plumages with no perceptible change in appearance. The primaries are shed outwards, starting at the innermost primary, P1, and up to three new primaries can be growing simultaneously. The moult of the rectrices and the body feathers, however, is not well known, but it is likely that the timing of the replacement of these is similar to that of the moult of the primaries.

Morphological characteristics exhibited by the members of the Callaeidae, including the extinct species, can be summarized as follows. The wings are relatively short in comparison with the body length, and are noticeably rounded at the tips. There are ten primaries, the outermost of which, primary P10, is comparatively long, and nine secondaries, including three tertials. The tail is long, and rounded at the tip; it consists of twelve rectrices. The bill varies among species. That of the kokako is rather short and robust, with a decurved upper mandible, whereas the bill of the saddlebacks is long and straight, with a compressed ridge along the culmen. Tongue morphology varies similarly, and appears to reflect diet more than it does ancestry. In the saddlebacks the tongue is lanceolate and shallowly bifid at the tip, while the kokako tongue is oblong and truncated at the tip. The extinct Huia had a sexually dimorphic bill, that of the adult female being very long and sickle-shaped, while the adult male's bill was shorter and only slightly decurved; the tongue of both sexes was narrow, tapering evenly towards the tip, which was somewhat frayed and brush-like. All callaeid species have a rather long tarsus with uniform laminiplantar scaling. The feet are moderately large and strong, with a comparatively long sharp hindclaw.

A feature of all members of this family, including both the three extant species and the two extinct ones, is the distinctive fleshy wattle at the gape, either hanging down from each side of the face or attached to the skin. This wattle, which is orange in all species except the North Island Kokako, in which it is blue, may become more prominent during courtship through vascularization.

All species are poor fliers, which glide, rather than flap, and all have a weakly developed keel on the sternum. Although not specifically investigated, the large nasal depressions of the callaeids would seem to indicate that olfaction may be important in the group. Osteologically, however, the group has been rather neglected. The kokako skull has a distinct "bridge" on the upper edge of the nasal, and large lachrymals with a thickened basal portion abutting the jugal bar. The eyes are protected by large postorbital processes and deep temporal fossae. There are two small unfused sesamoid bones, the larger of which separates the articulation of the lower mandible from the quadrate. The maxillopalatines are expanded below the vomer to form a pointed head, and the palatines are thickened, with the trans-palatine processes extending posteriorly to an acute tip. In terms of cranial details, the Huia is similar to the kokako in palate structure and postorbital processes, but it shows an articulation of the lower mandible that extends an unusual distance to the rear; it differs further in having smaller lachrymals, a distinct occipital crest, and lacking both deep temporal fossae and sesamoid bones. The skull of the saddlebacks is similar to that of the Huia, particularly in having a distinct extension of the retroarticular process of the lower mandible, but this is nevertheless relatively shorter than that of the Huia; in addition, there is no raised occipital crest, and little development of an exoccipital process. Otherwise, the skull proportions, particularly of the female, are similar to those of the Huia, although the quadrate and pterygoid are relatively smaller. Overall, the skull of the saddlebacks is apparently larger, in relation to body size, than that of the Huia.



Sometimes described as a "sequential specialist", the ***North Island Kokako*** *changes from one abundant food source to the next throughout the year. As the productive periods of one host plant species come to an end, the kokako moves on to another species that is coming into bloom, fruit or leaf. The short, robust bill with the decurved upper mandible equips the kokako for a primarily vegetarian diet of fruits and leaves, with other plant materials and invertebrates consumed less frequently. It forages throughout the day, climbing slowly up each tree while searching for food, before gliding (rather than flapping) to the next tree. It may even rummage on the forest floor. Although it is normally seen in pairs or singly, family groups may feed together outside the breeding period.*

[*Callaeas wilsoni*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Tui de Roy/Roving Tortoise Photos]

P. J. K. Burton, who investigated the head and neck anatomy of the Callaeidae, observed that, as well as similarities in plumage, osteology was instructive in elucidating relationships within the group. He found that both the Huia and the saddlebacks possess a feature which is apparently unique, a pars anterior, extending forwards from the articulation with the quadrate. Kokako show no adaptations for "gaping" (see Food and Feeding), and quite possibly did not evolve from a gaping ancestor. As Burton noted, it seems reasonable to suggest that the gaping adaptations of the Huia and the saddlebacks evolved independently of other families and in isolation, and, if this is correct, they are poor evidence for an affinity with other gaping forms.

Habitat

New Zealand wattlebirds once inhabited virtually all of the lowland and montane native forests of New Zealand. Formerly denizens of deep rainforest, they are now commonest in regenerating forests on offshore islands. While the kokako and the saddlebacks occurred on all three main islands, the Huia was apparently restricted entirely to the North Island, where, during the period of European settlement, it was commonest in the south. Significant habitat modification following human arrival, as well as predation by and competition from introduced mammals and possibly birds, has eradicated saddlebacks from all three islands, caused the extinction of the Huia and the South Island Kokako, and now restricted the North Island Kokako to a handful of isolated populations (see Status and Conservation).

The North Island Kokako is still found in the structurally complex lowland forests, preferring tall mature hardwood forest dominated by tawa (*Beilschmiedia tawa*) with emergent podocarps. On some offshore islands to which it has been transferred, the species has demonstrated a remarkable ability to adapt to unfamiliar habitats, those on Tiritiri Matangi Island, for example, occupying exotic brush wattle (*Paraserianthes*) forest. On the mainland, North Island Kokako are occasionally found also in exotic pine (*Pinus*) plantations. The South Island Kokako's habitat preferences are poorly documented, but it appears to have been commonest in the higher-altitude forests dominated by southern beech (*Nothofagus*).

Fossil evidence suggests that saddlebacks were once common in a variety of habitats throughout the largest islands. Today, translocated populations of both species occur in lowland beech forest and in mixed evergreen podocarp–hardwood forest, and populations of the North Island Saddleback can be found also in exotic pines and wattles. The North Island species' proclivity for any habitat in which it is placed, provided that it is free of rats (*Rattus*), suggests that this saddleback has always been a generalist, probably preferring seral forests and secondary growth with a high turnover of dead wood and numerous fruiting shrubs. There are indications, again from fossil evidence, that North Island Saddlebacks were able to adapt also to coastal and montane shrublands.

The Huia inhabited mainly mixed hardwood and podocarp forests, and occasionally beech forest, with a dense understorey. It was found from the forest edge to the coast.

General Habits

Kokako are shy birds with a cryptic coloration, and are most easily identified as being present in an area by their distinctive songs in the early morning. The same was said of the extinct Huia. The saddlebacks, in contrast, are considerably more forthright, constantly calling to advertise their presence and to keep in contact with the partner, and readily approaching humans to investigate them and perhaps to take advantage of any invertebrates disturbed from the forest floor.

None of the Callaeidae is particularly gregarious. All are usually seen singly or in pairs, but they may form small family groups after breeding. Foraging groups of up to ten newly independent young of the kokako and the saddlebacks have sometimes been reported in the autumn. Occasional gatherings of up to eight adult saddlebacks and up to 15 adult kokako are thought to be linked to territorial disputes.



Nectar plays a regular though minor part in the diets of all the New Zealand wattlebirds, and is eaten opportunistically. The adaptability of the ***North Island Saddleback*** *to almost any habitat in which it finds itself, including those dominated by exotic species such as pines and wattles, suggests that it has always been a generalist. However, it probably prefers habitats with a high turnover of dead wood and numerous fruiting shrubs. All the wattlebirds have suffered from introduced predators; North Island Kokako are also probably adversely affected by introduced omnivores and herbivores, which not only compete directly for the same fruits and berries, but have also altered the pattern of regeneration of forests in ways that reduce the availability of food throughout the year.*

[*Philesturnus rufusater*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Neil Fitzgerald]

All members of the family form long-term pair-bonds, often remaining paired for the life of one or other individual, and all are also highly territorial. Together, partners maintain their territory mostly by means of vocalizations, but during territorial disputes they will resort to threat displays, chasing and even, on occasion, physical fighting. The territory is an all-purpose one, generally providing all or most of what the pair requires for breeding, foraging and other aspects of its life, and is maintained from one year to the next. Territories of the North Island Kokako are generally of 4–20 ha.

Roosting normally takes place within the territory. Kokako roost in pairs, apparently near the top of a tall tree. They will sometimes change from one site to another, even regularly within a short period of time; one pair of North Island Kokako, for example, was found to utilize at least nine different roost-sites in a nine-week period. Saddlebacks roost in tree holes, beneath large epiphytes or, if no tree holes are available, in cavities in the ground. Other roost-sites used by the saddlebacks include spaces behind pendent dead leaves of large epiphytes growing on boughs or overhanging banks, downward-looping roots in hollows beneath banks, and dense vegetation on the ground, as well as crotches between large boughs. They will also make use of artificial roosting boxes provided by humans. Saddlebacks may use a single roost for several months, or even for years, but often, as with the kokako, they have several alternative roost-sites. Similarly, partners roost together within their territory, although, if no suitable sites are available, they will find one outside the territory.

Both saddlebacks and kokako bathe regularly. Saddlebacks often bathe at water-holes during the hottest hours of the day. While squatting in shallow water, they dip the head beneath the surface and then bring it up again to throw water over the back, also flapping the wings to create showers of spray. Having thoroughly wetted the plumage in this way, they then assume a more upright stance in order to help with draining of the water from the feathers. Kokako bathe by repeatedly immersing themselves briefly in water to wet the plumage, often also splashing water over the body by flapping the wings. In one case, a female North Island Kokako was seen to leave her nest and bathe in a nearby creek; she returned, quite wet, and shook her feathers to rid them of excess water, before sitting on the nest again. Later in the day, this same female repeated her bathing visit to the creek.

Preening frequently follows bathing, and is performed also at other times. In a study of the North Island Kokako at Puketi Forest, in Northland, in the early 1980s, resting and preening were observed at all times throughout the year, preening sessions lasting for 20–30 minutes. It was found, however, that kokako spent more time in these activities in the summer period, when they were moulting. Saddlebacks often pause during foraging in order to preen, and after bathing they will not infrequently devote a considerable amount of time to preening themselves on a nearby branch. Pair-members also preen each other at times, kokako indulging in such allopreening especially during courtship but also during confrontations with other kokako. Saddlebacks appear to use allopreening less often, although they do frequently preen their own dependent juveniles.

Sun-bathing has been recorded for the North Island Saddleback. During this maintenance activity, which can take place either on the ground or on a branch, the saddleback lifts one wing in order to expose its flank and underwing to the sun's rays. In addition, a possible case of anting by this species has been observed. A male saddleback, while foraging in leaf litter, was seen on several occasions to rub a small rounded-looking insect on the ground and then to rub it through the feathers of its underwing; the bird then swallowed the insect.

Voice

Vocalizations of New Zealand wattlebirds are varied, but all of the species produce melodious piping or organ-like sounds and flute-like vocalizations. The song of the North Island Kokako is described as a haunting and mournful series of loud, rich notes sounding like those produced by an organ, the whole lasting for about 30 seconds. It is often delivered from conspicuous perches and is said to be audible at up to about 1·6 km. Both sexes sing, sometimes in duet. This species sings throughout the year, but

predominantly in late spring and summer. It starts at sunrise and continues for up to 60–90 minutes.

The saddlebacks are often very noisy, uttering harsher chattering or churring vocalizations. The song is either a loud, repetitive chattering, given as "cheet, te-te-te-te" for the North Island form, and with great carrying power through thick forest; or a much shorter series of softer flute-like sounds audible only at close range. Interestingly, the song of the extinct Huia was described as an array of peculiar and strange whistles. With the saddlebacks and the kokako, both sexes sing and often perform duets, and both sometimes countersing with neighbours.

In the case of the three extant species, the vocalizations exhibit significant variation from one location to another, and the components of the song can be categorized into local dialects. It is suggested that these dialects allow information about the relationships between neighbours to be expressed. All three species respond strongly to any imitation or playback of their vocalizations.

Food and Feeding

New Zealand wattlebirds forage at all levels in the forest, from the floor, where they investigate leaf litter and decaying timber, to the upper levels among branches. They search both live and dead foliage of trees and shrubs, from near the ground up to the canopy. All members of the family are omnivorous, but the main components of the diet vary among the species, and this is reflected in the morphology of their bills. The North Island Kokako, with its rather short and robust bill with a decurved upper mandible, is primarily a vegetarian; it consumes mainly fruit and leaves and, less frequently, flowers, moss, buds, nectar and invertebrates. It has been called a "sequential specialist". This means that, as the flowering, fruiting or leaf-budding periods of one host-plant species wane, the kokako move on to another species that is just coming into bloom, fruit or leaf.

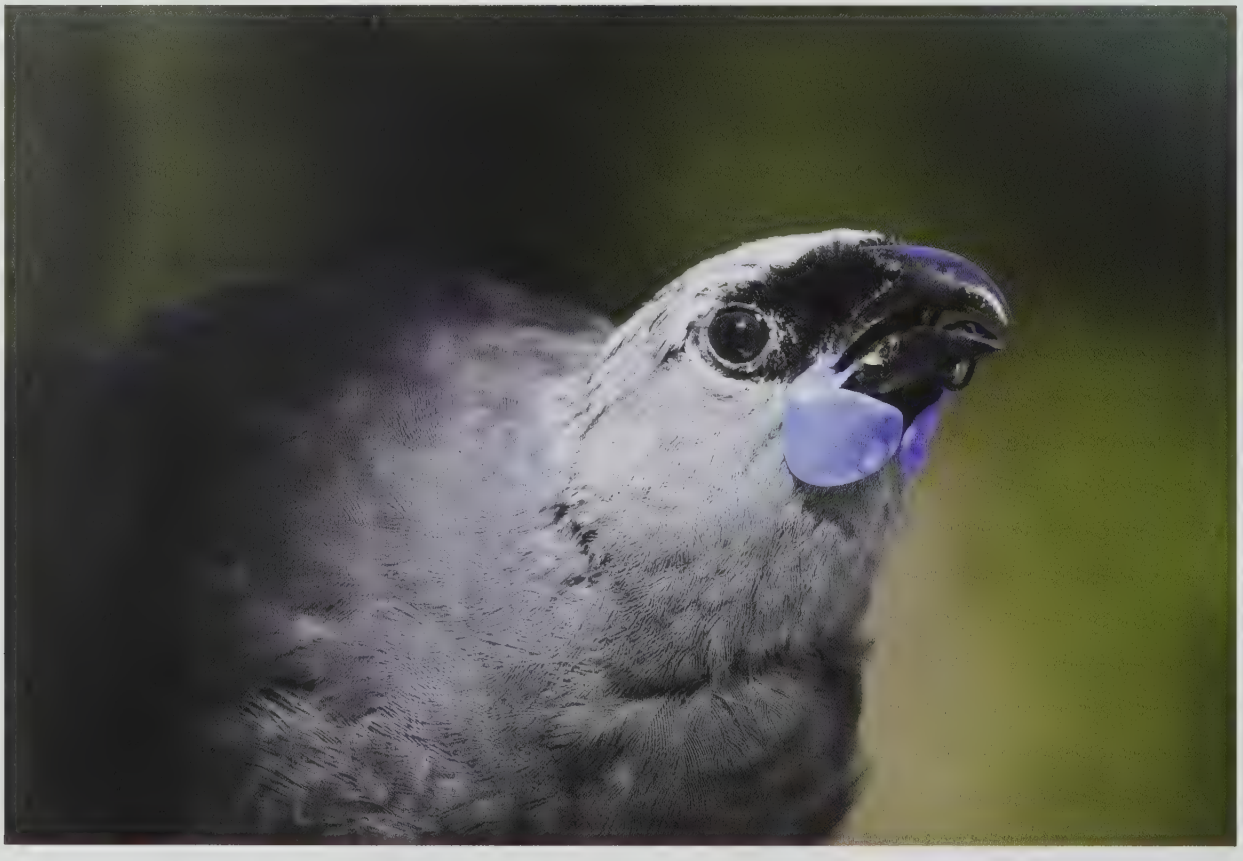
Saddlebacks feed predominantly on insects gleaned from leaf litter on the forest floor or in rotting logs. The long straight bill of the two species has large muscles, allowing it to be opened forcibly against resistance. The North Island Saddleback, at least, may vary its diet seasonally, especially in late summer, with the addition of berries, and it may take other invertebrates and nectar, and occasionally buds, opportunistically. Saddlebacks most frequently employ the techniques of probing, tearing and gleaning. They probe among the dead and decaying wood of branches, the bark of trees, and in and around trunks, stumps and logs, and often tear off chunks of bark or wood from trees, exposing insects beneath. Sometimes they lift fronds, leaves, lichens or moss, and they may toss leaves in the manner typical of a *Turdus* thrush, such as a Common Blackbird (*Turdus merula*). The bill of a foraging saddleback is held either open or closed, and the upper mandible is sometimes used as a skewer. By opening the mandibles, or gaping, while the bill is inside a hole in a soft substrate, the saddleback is able to enlarge the hole to allow food to be extracted. This open-bill probing has been termed "*Zirkeln*", which in German means "using dividers". The saddlebacks utilize the bill also as a lever in order to pry bark away from tree trunks and branches. All callaeid taxa use the feet in order to manipulate and hold food.

With its bizarre specialization of differing male and female bills, the extinct Huia is of particular interest. It was considered to be a specialist predator of the larvae of the huhu beetle (*Prionoplus reticularis*), but it also consumed other invertebrates, as well as fruit. The males had a well-developed cranial musculature, and they were able to break up rotten wood by chiselling and gaping; the females utilized their longer, slender and more decurved bill for probing into the holes and crevices.

Kokako and saddlebacks forage throughout the day, usually singly or in pairs, but very occasionally in larger groups. Although kokako are not known to participate in mixed-species flocks, saddlebacks are often seen while foraging with New Zealand Fantails (*Rhipidura fuliginosa*), Silvereyes (*Zosterops lateralis*) and other small forest passerines.

Breeding

Callaeids are monogamous, forming long-term, often permanent pair-bonds. They are all solitary nesters. All breed in the austral spring and summer, the North Island Saddleback being prone to



All wattlebirds need access to water for drinking and bathing. ***North Island Kokako*** *bathe by repeatedly immersing themselves briefly in water-holes or creeks to wet the plumage, often also splashing water over the body by flapping the wings. Although territorial and generally sedentary, North Island Saddlebacks* (Philesturnus rufusater) *living on offshore islands with restricted supplies of water have been recorded traversing neighbouring territories in order to drink. In contrast to the wattles of the saddlebacks, those of the North Island Kokako are not pendulous, but follow the contour of the feathering, extending from each side of the gape and over most of the cheek, and touching or overlapping across the throat.*

[*Callaeas wilsoni*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Peter Fuller]



All three extant species perform an "Archangel Display", in which a male raises his wings and moves rapidly around opposite his mate. The ***North Island Kokako*** *generally breeds in the austral spring and summer, but when food is abundant it may also breed in autumn, and so occasionally rears three broods in a year. Unlike the mostly cavity-nesting saddlebacks, the kokako builds a substantial cup-shaped nest from coarse twigs bound together with moss and lichens, in the understorey or subcanopy. The nest is well concealed in the fork of a tree or the top of a tree-fern, or among epiphytes or lianas. On hatching, kokako chicks are covered in light down. Fledging takes 32 to 37 days, up to 10 days longer than in the smaller saddlebacks.*

[*Callaeas wilsoni*, Otorohanga Breeding Centre, North Island, New Zealand. Photo: Tui de Roy/Roving Tortoise Photos]

earlier and later clutches and the South Island Saddleback, as well as the extinct Huia, restricted to spring and early summer. They normally raise one or two broods in a season, but the North Island Kokako occasionally rears three broods, and North Island Saddleback populations newly translocated to predator-free environments may raise four.

Males of the three extant species perform what are termed "Archangel Displays", in which the male, while in a tree or on the ground, raises its wings and moves about rapidly opposite his mate. He often carries in his bill some vegetation, which he repeatedly drops. In the case of the saddlebacks, this display is associated with the drawing of the female into a chosen nest-cavity, but it has not been suggested as having such a role for the kokako. The process of pair formation and the maintenance of the pair-bond are accompanied by song, and vocalizations also play a major role in all sexual activities and all other aspects of social behaviour. Courtship feeding, which is performed in all months but increasingly as the breeding season approaches, appears likewise to be important in reinforcing the pair-bond.

Callaeids build a large, cup-shaped nest consisting of a loosely constructed base, mostly of sticks and twigs, with an inner lining of finer material. Because of the confined spaces available to saddlebacks, which are cavity-nesters, the nests of these species are generally less substantial and more compact. Typically, the female constructs the nest alone. Various nesting sites are used, but kokako generally nest among the branches of trees and shrubs at a height of 2–31 m above the ground, but mostly above 10 m, whereas saddlebacks usually nest in hollows in trees or epiphytes at lower levels and not uncommonly nest on the ground.

Eggs of New Zealand wattlebirds are oval in shape, although some kokako eggs are elliptical-ovate. The ground colour is generally pale to dark pinkish-grey or purplish-grey, but varies to white and deep beige. The eggs are marked with spots and blotches and, more rarely, streaks or lines, these markings generally being either brown or purplish-brown in colour and concentrated at the larger end. In one study of the North Island Kokako, the eggs measured 34·2–42·1 × 25·7–29·2 mm; in other studies, the mean dimensions were 38·5 × 26 mm and 39 × 26·8 mm. The average size of North Island Saddleback eggs in one sample was 28·9 × 22·3 mm, while two eggs of this species from Hen Island, off the east coast of Northland, measured, respectively, 30 × 21·4 mm and 29·8 × 22·5 mm. The eggs of the South Island Saddleback, sample means of which are 32·4 × 22·2 mm and 32·5 × 22·1 mm, are on average about 2·5 mm longer than those of the North Island Saddleback.

Clutches usually consist of two or three eggs, but both single-egg clutches and, for saddlebacks and the Huia, four-egg clutches have been recorded in what were apparently natural conditions. It has been claimed that the Huia sometimes produced clutches of five eggs, although the reliability of such reports is open to question.

The female incubates the eggs and broods the chicks, being fed on the nest by the male. Feeding of the nestlings, however, is usually undertaken by both parents. The incubation period is generally from 18 to 20 days, although the extremes of successful incubation range from 16 days to as many as 28 days. The chicks are initially semi-altricial or altricial, and nidicolous; those of the saddlebacks are naked on hatching, while kokako chicks are covered in a light down. The duration of the fledging period is dependent on relative chick size, and normally ranges from about 25 days, as with the saddlebacks, to 37 days, as for the North Island Kokako. After having left the nest, the young continue to be fed by both parents for at least a few days, and often for much longer, especially if they represent the final brood of the season. Kokako are thought to live for us to about 20 years or more.

Studies indicate that the comparatively high levels of breeding failure of North Island Kokako on the mainland are largely the result of predation, mostly by small introduced mammals such as rats, especially black rats (*Rattus rattus*) and brown rats (*R. norvegicus*), mustelids and common brushtail possums (*Trichosurus vulpecula*). On offshore islands, where introduced mammalian predators are absent, predation is also the major cause of nest failure of all three extant species, but in these environments predatory birds such as the Pacific Marsh-harrier (*Circus approximans*), the Morepork (*Ninox novaeseelandiae*) and the Weka (*Gallirallus australis*) are generally implicated.

Movements

Breeding adults of both the saddlebacks and the North Island Kokako are sedentary and territorial throughout the year, and from one year to the next. Even so, North Island Saddlebacks living on offshore islands with restricted supplies of water and ephemeral abundances of certain foods are recorded as traversing neighbouring territories in order to forage and drink.

Juveniles of the North Island Kokako disperse, generally over distances of between 1·2 km and 2·1 km, but sometimes up to 20 km, before settling into territories of their own, often close to their own natal territory.

There were some suggestions in the early literature that the Huia may have migrated altitudinally during the year. It is difficult now to assess the likelihood that this occurred, and, if it did, the extent and frequency of such altitudinal movements.

Relationship with Man

In former times, kokako were occasionally hunted for food, although they were said not to be particularly palatable. The Maori people seldom consumed kokako meat, but they did so on rare occasions. They did, however, utilize the wattles of these birds as ornaments, which they usually wore on the cheeks. It seems that all members of the family were hunted to some degree, but generally not for food.

Little information is available on the attitude of humans to the New Zealand wattlebirds and the influence that the latter had on human thinking. What is known is that there was in the past a big demand for Huia feathers and body parts, which were used as adornments by local peoples, and this species seems to have held a special fascination for all those who encountered it. The Maori fashioned elaborate wooden boxes, intricately carved, in which they kept the tail feathers of this species. It is evident that the white-tipped black rectrices had a particular importance to the Maori, who considered the Huia to be a sacred bird. The tribal chiefs wore the tail feathers as a head-dress, especially in battle, but the rectrices were also, somewhat conversely, presented as a token of respect or friendship. In addition, these feathers were placed around vessels containing preserved animal food, especially pigeon (Columbidae), as an indication that this was food fit for chiefs, a further example of the significance attached to this species by the Maori. Huia skins, the legs and wings removed, were attached to the ears as decorative pendants, and dried Huia heads were likewise worn as ornaments.

Following the settlement and spread of Europeans across New Zealand, the demand for Huia specimens for museum collections increased. Moreover, a Maori guide, when he placed a Huia tail feather in the hat-band of the Duke of York, who was on a visit to New Zealand, started a fashion which very soon led to widespread hunting of the birds for their feathers. In the first years of the twentieth century a single Huia fetched the sum of £12, this representing £1 for each tail feather; by 1915, however, a single rectrix could be sold for £5, a significant amount of money at that time. It was not long before the Huia became extinct (see Status and Conservation).

Status and Conservation

Of the three extant members of the family Callaeidae, the North Island Kokako is listed as Endangered, while the two saddlebacks, when treated as conspecific, are classified as Near-threatened. A recent reassessment of New Zealand's endangered species, undertaken by the New Zealand Department of Conservation, has not changed these ratings. The main threats have been identified as predation by introduced mammals and, as with so many threatened species in all corners of the world, habitat reduction. North Island Kokako are probably adversely affected also by competition from introduced omnivores and herbivores, which not only compete directly for the same fruits and berries as those preferred by the kokako, but also have altered the pattern of regeneration of forests in a way that reduces the availability of high-quality foods throughout the year. The saddlebacks are effectively extinct on the New Zealand mainland, and the North Island Kokako is much reduced there, but saddleback numbers are increasing as a result of translocations to offshore islands and protected mainland sites. Despite a number of successful translocations, the North Island Kokako has declined massively



*The nestlings of **South Island Saddlebacks** are fed mostly on insects. The eggs of the South Island species are slightly larger on average than those of the North Island form, parallelling the case of the birds themselves. Upon hatching, after an incubation of around 20 days, the young are naked. Saddlebacks build their nests, often in natural cavities, in the sub-canopy and understorey, and not uncommonly on the ground. Since they also have the habit of roosting on the ground, they are unable to survive in the presence of rats, and all current South Island Saddleback populations are the result of translocations to islands free of mammalian predators. The original "donor" island populations became extinct after rats were introduced.*

[*Philesturnus carunculatus*, South Island, New Zealand. Photo: Konrad Wothe]



Although the 2007 estimate for the population of ***North Island Kokako*** *was of some 1486 adult birds, the actual breeding population was more precisely 681 pairs, because differential predation has left many subpopulations with an excess of unpaired males, leading in some cases to male–male couples. This species is listed as Endangered. Rates of decline have been as high as 50% in three years in some areas, and without management of its remaining populations, the North Island Kokako would be extinct on the New Zealand mainland. Conservation strategies include translocation, large-scale predator control, and introduction of females to subpopulations with a male bias.*

[*Callaeas wilsoni*, Otorohanga Breeding Centre, North Island, New Zealand. Photo: Mark Jones/Roving Tortoise Photos]

in the last 20 years, and it is now in a position where, without high-level management of its 18 remaining natural refuges, the species would become extinct on the New Zealand mainland. Once again, however, the most recent figures indicate an encouraging recovery of numbers.

The Huia has been extinct since the early part of the twentieth century. The last confirmed sighting was made in about 1907, although there are also several unconfirmed reports, including some perfectly credible ones, up to the 1920s and perhaps even beyond. The South Island Kokako may have survived until the 1960s, but it was "officially" declared extinct by the New Zealand Department of Conservation in January 2007.

Historically, most New Zealand bird species have been adversely affected by loss or fragmentation of habitat and by introduced predators. Fossil distribution indicates that all of the New Zealand wattlebird taxa were widely distributed at the time of Polynesian colonization of the islands, in the twelfth century. Large-scale deforestation, through fire, during the pre-European period restricted kokako and saddlebacks to areas of dense forest, and the Huia was limited to dense forest in the southern part of the North Island, being absent from the South Island. The introduction of the brown rat in about 1770, followed shortly thereafter by the black rat, probably doomed the saddlebacks to extinction on the New Zealand mainland, but the introduction of mustelids in the 1880s was the final nail in the coffin for these two species. Logging and fire were less significant in the decline of the saddlebacks than they were for the other wattlebirds, probably because the saddlebacks' smaller size, combined with their habit of roosting on the ground, led to their elimination by rats before large-scale European land clearance began. Saddlebacks survive to the present day only because of the existence of natural populations on rat-free islands, and their future has been safeguarded through a widespread series of translocations to predator-free islands and to other sites, including on the mainland, where the eradication of predators or intense control operations have been undertaken.

Kokako and Huia appear to have been less susceptible to rat predation, but the arrival of cats in the early years of the nineteenth century and of mustelids in the 1880s led rapidly to the decline of the South Island Kokako. This species was said to be fast approaching extinction by 1889, while its North Island counterpart was then still comparatively common. It has been suggested that the difference in mortality was due to the South Island species' habit of spending longer periods on the forest floor. Throughout the twentieth century the range of the North Island Kokako contracted as a result not only of logging, both clear-felling and selective logging, and subsequent habitat degradation, but also of large-scale clearing and burning of native vegetation, the effects of which were, to some extent, exacerbated by hunting. The speed of this decline increased in the 1970s, and by 2006 there were only 14 natural populations and five translocated populations.

What caused the extinction of the Huia is more obscure. This species is popularly thought to have been hunted to extinction by rapacious collectors, both Maori and European, who were attempting to service the insatiable demand for Huia feathers and body parts for human adornment and for museum specimens worldwide (see Relationship with Man). Although this may have been a contributory factor in the species' demise, there is little doubt that habitat loss and predation by introduced mammals, especially mustelids, played a significant part in the extinction of the Huia.

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Genus *CALLAEAS* J. R. Forster, 1788

1. North Island Kokako

Callaeas wilsoni

French: Glaucope de Wilson **German**: Graulappenvogel **Spanish**: Kokako
Other common names: Wattled/Blue-wattled/North Island Crow, Wattlebird

Taxonomy. *Glaucopis wilsoni* Bonaparte, 1850, North Island, New Zealand.
Often treated as conspecific with extinct *C. cinereus*, but differs in wattle colour (mainly orange in *C. cinereus*) and morphometrics, minor differences in plumage, also differences in behaviour and possibly vocalizations; recent genetic studies suggest that the two are better treated as separate species. Monotypic.
Distribution. Scattered localities on North I (including three small offshore islands), in New Zealand.



Descriptive notes. 38 cm; 200–250 g, male average 233 g, female average 218 g. Medium-sized to large forest passerine with short, wide downcurved bill, unusually long sturdy legs, long broad tail with rounded tip and distinctive downward curve, and broad, rounded wings, tips of which reach just past uppertail-coverts; prominent wattles extending from each side of gape and over most of cheek, touching or overlapping across throat (wattles not pendulous, but follow contour of feathering). Plumage is primarily blue-grey, with prominent black mask extending from slightly above bill to just above and behind eye and to chin; facial wattle cobalt-blue, increasing in size and in colour intensity and fleshiness in breeding season; tail blackish-brown, feathers with dark greyish-olive outer webs; wing mainly blue-grey, outer remiges olive-brown with blue-grey wash; iris dark brown, black eyering; bill black; legs black. Sexes alike, female slightly smaller than male. Juvenile is like adult, but plumage primarily sooty blue-grey and wattle small and pink; immature similar to juvenile but predominantly brownish-grey, with blue-grey wash on mantle, wattles becoming increasingly bluish on edges and turning purplish-pink and then pinkish-blue, and increase slowly in size. VOICE. Song, throughout year but mainly in late spring and summer, one of the most haunting and beautiful songs of any forest passerine and the principal means of locating the species, a loud 30-second sequence of slowly executed, rich organ-like notes, given by both sexes, sometimes in duet. Song begins at sunrise and continues for only 60–90 minutes; usually silent during rest of day, although a wide array of quiet contact and social calls recorded.
Habitat. Lowland podocarp–tawa hardwood forest with diverse understorey; from sea-level up to over 900 m. Tawa (*Beilschmiedia tawa*) an important component of nearly all current natural refuges, the only exception being Puketi (in extreme N of North I), where occurs in mixed kauri (*Agathis australis*)–hardwood forest. Occasionally found in shrublands and regenerating seral forest, and in mature exotic forests adjacent to territories. Tiritiri Matangi I (where translocated population survives) contains a small amount of established pohutukawa (*Metrosideros excelsa*) forest and large areas of shrubland, grassland and exotic brush wattle (*Paraserianthes*) forest and other exotic canopy trees, suggesting that habitat preferences of present species may be less restrictive than was previously thought.
Food and Feeding. Diet mainly leaves and fruit, with flowers, buds, nectar and invertebrates taken less frequently; has been suggested that nestling diet may be richer in invertebrates. A sequential specialist, changing from one abundant food source to the next throughout year. Forages throughout day, generally in pairs or singly, also in family groups during non-breeding period. During foraging, glides between food trees; climbs slowly up each tree while searching for food, before gliding to next tree. Often holds foliage with feet in manner of a parrot (Psittacidae) while on a stable platform such as large branch; also picks fruit or gleans insects, and even rummages about on forest floor. Occasionally recorded as balling up moss on forest floor and possibly eating capsules and foliage, but this behaviour could be a method of reaching invertebrates or water in the moss. A poor flier, preferring gliding to flapping, and rarely travelling more than 50 m through canopy in one flight.
Breeding. Breeds generally in austral spring and summer, also in early autumn but only when food abundant, with laying Oct–Mar and latest nestlings and fledglings recorded May; in a good season up to three or, exceptionally, four broods. Nest a substantial cup-shaped structure built from coarse twigs bound together with moss, lichens and similar, with inner lining of finer twigs and leaves, well supported but well concealed in fork of tree, top of tree-fern, in epiphytes or among mass of lianas, mostly in understorey or subcanopy. Clutch 1–3 eggs, usually 2 or 3; incubation by female, period on average 18 days, but successful incubation periods of 16–21 days recorded; chicks brooded by female, fed by both parents, fledging period variable, 27–42 days, mostly 32–37 days. At mainland sites, up to 42% of pairs produce one or more chicks each year when mammalian predators controlled, whereas success per pair on average 13% per season when predators uncontrolled; natural avian predators include Pacific Marsh-Harrier (*Circus approximans*) and Morepork (*Ninox novaeseelandiae*). Long-lived, probably up to 25 years.
Movements. Primarily sedentary. Juvenile dispersal generally only 1·2–2·1 km, but one individual moved at least 20·2 km.
Status and Conservation. ENDANGERED. Global population thought to number c. 750 pairs with well over 1500 adults (males predominate in population); number of immatures not known. Listed as Endangered owing to very small effective population size, which is partially due to differential predation with females very vulnerable during nesting, leaving many subpopulations with an excess of unpaired males, and often leading to couples consisting of two males. Restricted to 18 localities, including three offshore islands. Formerly more widespread in forests of North I and smaller offshore islands. Remaining populations found in Hunua Ranges, Mataraua, Kaharoa, Rotoehu, Pureora and Mapara forests, and in Te Urewera National Park (450 km^2); subpopulations entirely isolated as a result of habitat fragmentation. Populations increasing in areas where intensive conservation practised, but still declining elsewhere; now extinct in most sites where no management work undertaken. Rates of decline as high as 50% in three years in some areas. Species is entirely dependent on conservation; each population requires annual control of predators until at least 25 breeding pairs present, followed by minimum of three years of management every ten years in order to maintain population growth. Historic declines were due to large-scale habitat destruction leading to fragmentation, combined with direct effects of introduction of predators and indirect effects of introduced species as competitors. Predation by black rat (*Rattus rattus*), common brushtail possum (*Trichosurus vulpecula*), stoat (*Mustela erminea*) and feral cats are primary causes of present decline; brushtail possum also competes for serially available food items, and introduced goats and deer destroy important understorey foodplants. Majority of remaining occupied habitat is protected, and in most subpopulations brushtail possum and black rat are controlled or eradicated. All subpopulations have decreased very rapidly and fragmented further over the last 20–30 years. Unmanaged subpopulations likely to decline to extinction, at least two having been lost in the last ten years. However, intensive conservation efforts originally aimed to restore the population to more than 1000 pairs by the year 2020, and recent good results suggest target may be achieved by 2013. Recent research concentrated on cost-effective large-scale predator control. Present species introduced on three small islands; young females have also been introduced in two managed remnant male/predominantly male populations on mainland; some individuals interchanged between sites in order to maintain broad genetic base. Two small populations held in captivity.
Bibliography. Anon. (2008c), Bain (2008), Bassé *et al.* (2003), Best, E. (1942), Best, H.A. & Bellingham (1990), Bradfield & Flux (1996), Brown *et al.* (1993), Buller (1888), Butchart & Stattersfield (2004), Collar *et al.* (1994), Ewen *et al.* (2006), Fairburn *et al.* (2004), Flux & Innes (2001), Flux *et al.* (2006), Fuller (2002), Gill (1993), Greene (1995), Hay (1984), Heather & Robertson (1997), Higgins *et al.* (2006b), Holdaway *et al.* (2001), Hudson *et al.* (2000), Innes & Flux (1999), Innes & Hay (1995), Innes, Brown *et al.* (1996), Innes, Hay *et al.* (1999), Lavers (1978), Leathwick *et al.* (1983), Maning (1960), McKenzie (1951), Molles *et al.* (2006), Moore & Innes (1996), O'Donnell (1984), Oliver (1955), Powlesland (1987), Rowe (2007), Sinclair *et al.* (2006), St Paul & McKenzie (1974), Stattersfield & Capper (2000), Stonor (1942), Thorogood *et al.* (2007).

Genus *PHILESTURNUS* I. Geoffroy Saint-Hilaire, 1832

2. South Island Saddleback
Philesturnus carunculatus

French: Créadion rounoir **German**: Südinsel-Sattelvogel **Spanish**: Tieke de Isla Sur
Other common names: Tieke, Wattled Starling(!); Jackbird (juvenile)

Taxonomy. *Sturnus carunculatus* J. F. Gmelin, 1789, Queen Charlotte Sound, South Island, New Zealand.
Genus sometimes listed as *Creadion* (see page 231). Often treated as conspecific with *P. rufusater*, but differs in details of adult plumage, morphometrics, behaviour and vocalizations, and especially in possession of a distinct juvenile plumage. Monotypic.
Distribution. New Zealand: extreme NE & SW South I (Motuara I, in Queen Charlotte Sound, and islands off Fiordland) and islands off Stewart I. Recently introduced to Erin I, in Lake Te Anau (Fiordland).



Descriptive notes. 25 cm; 61–94 g, male average 85 g, female average 75 g. Medium-sized passerine with strong slightly downcurved bill, long tail with rounded tip and distinctive downward curve, and short, rounded wings, tips of which reach just past uppertail-coverts; small pendulous wattle extends from gape over malar area and down to throat. Plumage is mostly glossy black (faint metallic blue sheen in bright light), with prominent dark orange or red-brown "saddle" from mantle to rump and extending to secondary upperwing-coverts; slightly darker lores, giving impression of mask (in bright sunlight); tail black (bluish sheen in bright light); upperwing except for secondary coverts black-brown; facial wattle reddish-orange, increasing in size, in colour intensity and in fleshiness in breeding season; iris black-brown, black eyering; bill and legs black. Sexes alike in plumage, male slightly larger and generally with larger wattle than female. Juvenile is very different from adult, has dark brown plumage with chestnut wash on head and rump, dark lores, wattle small and pink, initially has yellowish gape-line; immature similar to juvenile, but with increasingly large amounts of black on body (retains brown juvenile rectrices and remiges), wattles becoming increasingly reddish-orange and slowly growing in size. VOICE. Noisy and boisterous, though apparently less so than *P. rufusater*. Song the commonest vocalization, heard throughout year, a loud repetitive chattering, with great carrying power through thick forest, given by both sexes (apparently dimorphic in structure), apparently also dialectal in structure (neighbouring and related individuals likely to have similar songs); sings throughout day, but territorial countersinging generally heard mainly in early morning. Male, when provisioning female, calls her off nest by uttering loud "cheeet ta-chet ta-chet ta-chet" from distance of 10–20 m; quiet contact calls, whistles and pips also recorded.
Habitat. All current populations are at sites where species has been translocated. At successful reintroduction sites, available habitat almost entirely restricted to evergreen coastal forest and mixed lowland broadleaf forests, especially seral forest and second growth, and on these islands may occur at elevations of up to 152 m. In Big South Cape (Taukihepa) Group, off SW Stewart I, original habitat was dominated by *Olearia* tree daisies and southern rata (*Metrosideros umbellata*); translocated individuals on Ulva I and Breaksea I appear to prefer to establish breeding territories in coastal scrub, the dominant habitat feature of Big South Cape.
Food and Feeding. Food predominantly invertebrates and berries, occasionally honeydew, nectar of flax (*Phormium cookianum*) and fruit of the araliaceous five-finger (*Pseudopanax arboreus*). Nestlings on Solomon I fed almost entirely with grubs. On Motuara I obtained most food from the ground and five-finger, and number of prey captured generally reflected the amount of time spent on foraging substrates. Gleans items; also uses technique of gaping, and pries bark. Uses bill to pick scale insects (of genus *Ctenochiton*) off leaf surfaces, and licks honeydew from leaf surfaces while securing leaf bunches with a foot in manner of a parrot (Psittacidae).
Breeding. Timing and frequency probably density-dependent, generally breeding in austral spring and summer, with early-autumn records only when food abundant or population low; on Ulva I, breeding recorded between late Sept and late Mar, with first clutch laid in last week Sept; on Breaksea I and Motuara I, first eggs in respectively second and third weeks of Oct, and most nests contained eggs or nestlings between third week Oct and first week Jan. Nest, built by female alone, a medium-sized cup made from twigs (generally found nearby), bound together with moss, lichens and similar materials, with inner lining of finer twigs and leaves, very rarely with feathers, placed in natural cavity (54% of nests on Motuara I, 80% on Ulva I) or in flax (67% of nests on Breaksea I), generally in understorey or subcanopy. Clutch 1–2 eggs, usually 2; incubation by female, average period c. 20 days; chicks brooded by female, fed by both parents, fledging period 25–27 days. As all sites are free of mammalian predators, nest failure generally due to avian predators such as Pacific Marsh-harrier (*Circus approximans*), Morepork (*Ninox novaeseelandiae*) and Weka (*Gallirallus australis*).
Movements. Adults sedentary and territorial all year. Juvenile dispersal in general probably less than 3 km. Translocated individuals on Motuara I dispersed over 59 ha of island over a period of 8–10 months.
Status and Conservation. Not assessed. Probably Vulnerable. When treated as conspecific with *P. rufusater*, the enlarged species is considered Near-threatened. Confined to small islands off South I (including one island on an inland lake) and off Stewart I. Unable to co-exist with any rat species, including Polynesian rat (*Rattus exulans*), or any other introduced mammals, and prior to 1964 was therefore restricted to three islands in Big South Cape Group, off Stewart I. All current populations are the result of translocations. Introduced predatory mammals responsible for extinction on mainland; arrival of black rat (*Rattus rattus*) on the three islets off Stewart I in 1963 caused rapid extinction of populations. Since 1964, has been established on 16 islands, and populations on the three original "donor" island have become extinct; recently, however, rats have been eradicated from all three original islands, and it is likely that the saddleback will be reintroduced shortly. Global population has increased to over 1200 individuals, with capacity to increase to 2500 even without further reintroductions. Although populations adequate and well spread out, the threat of accidental introduction of predators on remaining islands still a concern, especially in light of recent documented outbreaks of avian pox and malaria on Long I.
Bibliography. Anon. (2008c), Bell (1978), Buller (1888), Butchart & Stattersfield (2004), Heather & Robertson (1997), Higgins *et al.* (2006b), Hooson & Jamieson (2003a, 2003b, 2004), Lovegrove (1996b), Merton (1975), Michel *et al.* (2008), Pierre (1999, 2000), Roberts (1994), Steffens *et al.* (2005).

3. North Island Saddleback
Philesturnus rufusater

French: Créadion de Lesson **German**: Nordinsel-Sattelvogel **Spanish**: Tieke de Isla Norte
Other common names: Tieke, Wattled Starling(!)

Taxonomy. *Icterus rufusater* Lesson, 1828, Bay of Islands, North Island, New Zealand.
Genus sometimes listed as *Creadion* (see page 231). Often treated as conspecific with *P. carunculatus*, but differs in details of adult plumage, morphometrics, behaviour and vocalizations, and especially in lacking a distinct juvenile plumage. Monotypic.
Distribution. North I, in New Zealand: self-sustaining populations now restricted to islands off N coast, also Kapiti I, off S coast. Attempted establishment of at least three populations within fenced mainland sites on North I.



Descriptive notes. 25 cm; 61–94 g, male average 80 g, female average 70 g. Medium-sized passerine with strong slightly downcurved bill, long tail with rounded tip and distinctive downward curve, and short, rounded wings, tips of which reach just past uppertail-coverts; small pendulous wattle extends from gape over malar area and down to throat. Plumage is mostly glossy black (faint metallic blue sheen in bright light), with prominent dark orange or red-brown "saddle" from mantle to rump and extending to secondary upperwing-coverts, saddle edged with narrow yellowish band (which becomes brighter on older males); slightly darker lores, giving impression of mask (in bright sunlight); tail black (bluish sheen in bright light); upperwing except for secondary coverts black-brown; facial wattle reddish-orange, increasing in size, in colour intensity and in fleshiness in breeding season; iris black-brown, black eyering; bill and legs black. Sexes alike in plumage, male slightly larger and generally with larger wattle than female. Juvenile is similar to adult, but with mostly brownish-black, not glossy black, plumage, less pronounced, duller mantle that lacks yellow leading edge, chestnut undertail-coverts, and weak brown barring on belly, wattles small and pink, initially has yellowish gape-line; immature similar to juvenile, but with increasingly large amounts of black on body (retains brown juvenile rectrices and remiges), wattles becoming increasingly reddish-orange and slowly growing in size. VOICE. Noisy and boisterous. Song is commonest vocalization, given throughout year, a loud repetitive "cheet, te-te-te-te", by both sexes (though dimorphic in structure), with great carrying power through thick forest; song structure dialectal, with neighbouring and related individuals likely to have similar songs; sings throughout day, but territorial countersinging generally heard mainly in early morning. Wide array of quiet contact and social calls also recorded.
Habitat. Majority of islands where this species now present are sites to which it has been translocated. At sites where successfully reintroduced, available habitat is almost entirely restricted to evergreen coastal forest and mixed lowland broadleaf forests, especially seral forest and second growth; on these islands may occur at up to 700 m. In original surviving population, most abundant in forests dominated by pohutukawa (*Metrosideros excelsa*), kanuka (*Kunzea*), and evergreen broadleaf species such as *Vitex* and *Beilschmiedia*. Translocated population on Tititiri Matangi I has even adapted to introduced brush wattle (*Paraserianthes*).
Food and Feeding. Food mainly invertebrates and berries, occasionally nectar. Nestling diet apparently richer in invertebrates. Generally forages in pairs, or in family groups during non-breeding period; larger groups occasionally recorded. Forages at all levels of forest, in leaf litter, on decaying timber and among braches and foliage right up to canopy, during most of day. Foraging heights vary seasonally, with more time spent on ground in winter and more time spent in foraging on fruits in late summer and autumn. Male and female may exploit different heights when foraging together, with males more frequently on ground. Gleans food items; also uses technique of gaping, and pries bark from branches and trunks. Fruits generally gleaned, but larger fruits may be pecked at *in situ*. Attacks prey items while actively searching on ground, lifting leaf litter; may toss leaves in manner of a *Turdus* thrush. Climbs slowly up each tree before flying/gliding or hopping to next tree. Removes bark by grasping it with bill and using own weight to pull bark away. Often holds prey with foot in manner of a parrot (Psittacidae); use bill to give sharp jabs to larger prey before dismembering them; repeatedly smashes caterpillars into branches before swallowing.
Breeding. Timing and frequency appear dependent on density, generally breeding in spring and summer, with early-autumn records only when food abundant or population low; laying Aug–Mar and latest nestlings and fledglings recorded in May; can have 3–4 broods in a good season with low population density. Nest, built solely by female, a medium-sized cup made from twigs (usually found nearby), bound together with moss, lichens or other filamentous vegetation, with inner lining of finer twigs and leaves and very rarely with some feathers, placed generally in hole or cavity in trunk or thick branch of tree in understorey or subcanopy, sometimes on ground in rock crevice or among dense epiphytes, rarely in crown of tree-fern or flax (*Phormium*), commonly in nestbox when available; sites other than nestboxes rarely reused. Clutch 1–4 eggs, usually 2; incubation by female, period on average 18 days; chicks brooded by female, fed by both parents, fledging period 23–27 days. Where Polynesian rats (*Rattus exulans*) present, few nests successful unless in secure hole or nestbox; as majority of sites free of mammalian predators, nest failure generally due to avian predators such as Pacific Marsh-harrier (*Circus approximans*), Morepork (*Ninox novaeseelandiae*) and Weka (*Gallirallus australis*) and introduced Common Myna (*Acridotheres tristis*). Long-lived for a medium-sized passerine; maximum recorded longevity 21 years, and 18–20 years common.
Movements. Adults sedentary and territorial all year. Juvenile dispersal generally less than 3 km. Translocated birds may travel 5 km before establishing territories. Birds from the Wellington Karori population have been recorded in several parts of the city many kilometres from the sanctuary.
Status and Conservation. Not assessed. Probably Near-threatened. When treated as conspecific with *P. carunculatus*, the enlarged species is considered Near-threatened. Confined to islands off North I. Although able to exist in presence of Polynesian rat, unable to co-exist with brown rat (*Rattus norvegicus*) and cannot survive with other introduced predators; prior to 1964, species was restricted to Hen I, in Hauraki Gulf. Introduced predatory mammals responsible for extinction on mainland. Since 1964, has been introduced successfully on 13 islands off North I, and global population now more than 6000 individuals, with capacity to increase to over 19,000 individuals. Although three introductions on mainland areas have been tested, only those made in two predator-fenced areas have been successful, and survival here dependent on intense management. Although current populations large and well spread out, accidental introduction of predators on the islands still a potential threat.
Bibliography. Anon. (2008c), Buller (1888), Butchart & Stattersfield (2004), Cassey *et al.* (2007), Heather & Robertson (1997), Higgins *et al.* (2006b), Hooson & Jamieson (2003a), Jenkins & Veitch (1991), Lambert *et al.* (2005), Lovegrove (1992, 1996a, 1996b), Lovegrove & O'Callaghan (1982), Merton (1975), Stamp *et al.* (2002).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family NOTIOMYSTIDAE (STITCHBIRD)



- Medium-sized, rather plump passerine with fairly short and slightly decurved bill, rather long tail often held cocked, and broad rounded wings with prominent white patch.
- 18 cm.



- New Zealand.
- Forest.
- 1 genus, 1 species, 1 taxon.
- 1 species threatened; none extinct since 1600.

Systematics

The Stitchbird (*Notiomystis cincta*), known also as the "Hihi", a distinctive New Zealand endemic, has generally been treated as a honeyeater (Meliphagidae), albeit an unusual one. The main reason for including it among the honeyeaters is that it has a brush-tipped tongue and is largely nectarivorous. Recent phylogenetic analysis of both nuclear and mitochondrial DNA sequences carried out by A. C. Driskell and her colleagues, however, showed unequivocally that the Stitchbird was not a honeyeater at all. Their results, and those of a similar study by J. G. Ewen and co-workers, placed the Stitchbird in a clade that included the endemic New Zealand wattlebird family, Callaeidae, which comprises the saddlebacks (*Philesturnus*), the kokako (*Callaeas*) and the Huia (*Heteralocha acutirostris*). The affinities of this Stitchbird–New Zealand wattlebird clade were less clearly resolved. According to the DNA studies of F. K. Barker and colleagues, the New Zealand wattlebirds are part of a basal assemblage that may include the berrypeckers and longbills (Melanocharitidae) and the cnemophiline satinbirds, the latter currently placed in the bird-of-paradise family (Paradisaeidae), but many more data are required.

On the basis of DNA-clock analysis, Driskell and her colleagues estimated that the Stitchbird diverged from the New Zealand wattlebirds 28–39 million years ago. The other two endemic New Zealand species classed as honeyeaters, the Tui (*Prosthemadera novaeseelandiae*) and the New Zealand Bellbird (*Anthornis melanura*), were confirmed as being honeyeaters by these DNA studies.

Driskell and colleagues reassessed the nature of several morphological and behavioural characters that further indicated that the Stitchbird is not a honeyeater. Although brush-tipped at the end, the tongue of this species has its edge curled dorsally to form a tube for most of the length. Honeyeaters tend to have a furrowed tongue, and this, if tubular, is so for only a short part. The tongue of the saddlebacks and the kokako is fairly broad and flat. The Stitchbird also lacks the pneumatic tricipital fossa of the humerus that all honeyeaters possess. According to W. E. Boles, there are significant differences between the Stitchbird and the honeyeaters in the structure for the attachment of the toes (tarsometatarsus). In a study of the sterna of Australasian passerines, G. R. Fulton and Boles observed that most Australian honeyeaters have multiple foramina (small excavations) on the dorsal face of the sternum along the mid-line, whereas such foramina were absent in the Stitchbird and in the saddlebacks and kokako. The Stitchbird differs from the New Zealand wattlebirds in lacking the fleshy gape wattles and differs from the honeyeaters in having large rictal bristles.

In behaviour, too, the Stitchbird is quite different from honeyeaters. Unlike the latter, it nests in cavities, a habit which it has in common with the saddlebacks. Interestingly, the saddlebacks are partially nectarivorous, as is the Stitchbird. The mating system of the Stitchbird is complex (see Breeding), and not only have polyandry and polygyny been recorded but also polygynandry, both females and males having multiple partners during the breeding season. Moreover, the Stitchbird is the only species of bird known to engage in face-to-face copulation, although the sexes of this species do copulate also in the normal avian fashion.

On the combined criteria of DNA relationships, molecular-clock divergence dates and morphological considerations, Driskell and colleagues separated the Stitchbird into its own monophyletic family, Notiomystidae.

Early European settlers in New Zealand used the vernacular name "Stitch Bird", after the species' frequently heard warning call, a single or repeated "titch" note (see Voice). The Maori name of Hihi, which is widely used in the literature, also apparently refers to this call. The first published mention of the Stitchbird is a short account in 1835 by the Reverend W. Yate, who lived at the Bay of Islands, and this, as W. R. B. Oliver suggests, indicates that the birds were probably extant there at the time.

The taxonomic nomenclature of the Stitchbird is, mercifully, fairly straightforward. Originally described by du Bus de Gisignies in 1839, it was placed within the honeyeater genus *Meliphaga*, with the Latin epithet *cincta*, referring to the golden-yellow band bordering the hood of the male. As early as 1846, G. R. Gray used the generic name *Pogonornis* for this species, this name derived from a combination of the Greek *pogon*, referring to a beard, and *ornis*, a bird, a reference to the long rictal bristles. It was C. W. Richmond who, some 60 years later, erected the genus *Notiomystis* as a new name for the preoccupied *Pogonornis*. The new generic name referred to the Stitchbird's distribution and uncertain affinities, combining the Greek *notios*, meaning "southern", and *mustes*, meaning "a mystic" or "a mystery".

In 1935, G. M. Mathews proposed that the population of Little Barrier Island, in the outer Hauraki Gulf, be treated as a separate subspecies, *hautura*. This was said to be shorter-winged than other populations of the species, which were by then already extinct, and the male was apparently more yellow below the throat.



Until DNA analysis showed otherwise, the New Zealand endemic ***Stitchbird*** *was treated as a honeyeater (Meliphagidae) on the basis of its brush-tipped tongue, and its nectarivory. It is now placed in a monospecific family of its own, Notiomystidae, and has been grouped in a clade with the endemic New Zealand wattlebirds (Callaeidae). A smallish, stocky passerine, the Stitchbird is strongly sexually dimorphic. The male, shown here, has a large black hood, with conspicuous white erectile tufts.*

[*Notiomystis cincta*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Tui de Roy/ Roving Tortoise Photos]

Differences between the Little Barrier populations and those elsewhere seem, however, to be somewhat obscure, and there appears to be some overlap in measurements, at least.

Morphological Aspects

The Stitchbird is a typical, rather stocky ten-primaried passerine. It is medium-small, being about 18 cm in total length. It possesses a specialized, brush-tipped tongue and a slightly decurved and slender bill, both associated with a strongly nectarivorous diet combined with the consumption of fruit and small invertebrates (see Food and Feeding). A combination of characters superficially similar to, but convergent with, those of honeyeaters has for long been the principal basis on which the Stitchbird was placed in the family Meliphagidae (see Systematics).

This species is strongly sexually dimorphic in size and plumage, with the males larger and more colourful than the females. The mean weight of males is 37·5 g, whereas that of females is some 20% less, at 30 g. In addition, females are significantly smaller in total head length and in the lengths of the wing, tail, bill and tarsus, although there is an overlap between the sexes in all measurements. Stitchbirds are much smaller than Tuis, which are 27–32 cm in length, males having an average weight of 120 g and females one of 86 g, but they are very similar in size to New Zealand Bellbirds, which are 17–20 cm long, with average weights of about 31 g for males and about 24 g for females. Both sexes of the Stitchbird have been found to exhibit a significant increase in wing length with increasing age. There are also seasonal differences, wing length being greater in the six months immediately after the primary moult (April–September) than during the six months preceding the next moult (October–March), as the feathers become progressively worn. On Tiritiri Matangi Island, both sexes varied in weight over the year, and were heavier during the autumn and winter: the mean weight of males ranged from 37·2 g, in December, to 45 g, in April, and that of females in the same months from 30·1 g to 35·6 g.

In terms of plumage, the adult male is distinctive. It has a large black hood, bordered by a golden-yellow band extending from the shoulder downwards towards the centre of the lower breast. The rest of the upperbody merges to grey-black and olive-brown, and the underbody is dirty off-white with diffuse darker streaking. The uppertail and upperwings are blackish, but the wings are strongly patterned with a large white blaze across the base of the tertials and inner greater secondary coverts, and yellow fringes or edges on the secondary coverts and the secondaries and primaries, which combine to form pale panels on the folded wing. The yellow margins of the wing-coverts and remiges constitute a pattern that is commonly found within the Meliphagidae. Compared with the male, the adult female is a much duller and plainer bird, generally brownish-olive, although paler brownish-grey with diffuse dark streaking below. The wing pattern is similar to that of the male, including the prominent white patch, but the ground colour is duller blackish-brown and the fringes and edges of the coverts and remiges are duller, more yellow-olive. Males and females in first immature, or first basic, plumage are very similar to the respective adults.

Plumage ornamentation of the male is restricted to a pair of white and erectile tufts on each side of the nape. These nape-tufts are large, with a mean length of 13 mm, and are conspicuous against the velvety black hood; the length of the tuft increases with age. On the female, white is restricted to tiny subterminal spots on the feathers of the side of the nape, these combining to form small white spots that are considerably smaller than the tufts of the male; they have a mean length of 2 mm and in the field are usually concealed, although they are sometimes visible. Unlike any of the honeyeaters, the Stitchbird has prominent bristles around the base of the bill. These consist of four large, black rictal bristles arising at the base of the gape and several other black bristles on the chin and lower forehead.

The bare parts are unexceptional, and exhibit only slight sexual dimorphism. The bill is moderately long, about half the length of the head, and is slender and slightly decurved, most obviously towards the pointed tip; that of the male has an average length of 21·5 mm, the corresponding figure for females being 20·5 mm. The bill of the adult is black, although females often have a dark brown base on the lower mandible, and the tongue is pink. As already mentioned (see Systematics), the tongue is brush-tipped and partly tubular, adaptations to nectar-feeding, but the structure differs markedly from that found in the Meliphagidae. The eyes appear fairly large, and the irides are blackish-brown. A narrow orbital ring varies from grey-black to dark blue-grey or dark brown, and is generally inconspicuous. The legs are moderately long and slender, with holothecal (undivided) scaling, and the tibia is fully feathered. The middle toe is the longest, although the hind toe can be almost as long. The legs and feet vary from dark brown to red-brown or pinkish-brown or dark grey, and the soles are pink-buff or creamy.

Stitchbird wings are broad and rounded, with ten primaries and nine secondaries, the latter including three tertials. If the pri-

maries are numbered descendantly, from the innermost outwards, primary P6 is the longest, and several outer primaries (P5–P8) have slight emarginations on the outer webs. Unlike the two endemic New Zealand honeyeaters, namely the Tui and the New Zealand Bellbird, the Stitchbird does not have specially shaped remiges and it does not, therefore, produce loud wing noises like the ones heard from those two species. The tail is fairly long and is square-cut at the tip; it contains twelve rectrices.

Relatively little information is available on the moults of the Stitchbird. Adults undergo a complete post-breeding, or pre-basic, moult annually, with no change in appearance other than the overall freshness of the plumage. There are, however, few published details of the timing or the pattern of moults. The primaries are replaced outwards, descendantly, and this moult appears to be complete, or largely so, by the end of March; early stages of primary moult have been recorded in December. Thus, primary moult occurs late in the breeding season, but it is not known whether any individuals experience an overlap in the timing of the moult and breeding. The tail feathers are likely to be replaced centrifugally, from the central pair outwards.

Juveniles are very similar in plumage to the adult female, but are duller and browner still, with less streaking below, and have a duller, buff patch on the folded wing. The bare parts differ from those of the adult female. The juvenile has a duller, grey-black bill, with a dirty yellow or brownish-orange basal two-thirds of the lower mandible and, most obviously, prominent, swollen yellowish or orange-yellow gape-flanges. Young usually begin their post-juvenile, or first pre-basic, moult about four weeks after fledging. This moult is usually partial, resulting in an adult-like first immature plumage, although a small proportion of young appear to undergo a complete moult, resulting in adult plumage. Study is needed, however, in order to determine whether the post-juvenile moult is ever a complete one.

Most interestingly, M. Low and I. Castro and their colleagues have shown a particular aspect of the Stitchbird's morphology that is directly related to the mating system and copulatory behaviour of this species (see Breeding). Male Stitchbirds have one of the largest cloacal protuberances of any bird species, and the volume of this increases almost four-fold between the non-breeding and breeding seasons. Further, the cloacal protuberance changes its orientation seasonally by approximately 60 degrees, so that it becomes almost perpendicular to the abdomen, rather than facing posteriorly, in the breeding season. This change in orientation improves the apposition of the male and female cloacal openings during face-to-face forced copulation by this species (see Breeding). The female cloacal volume changes in much the same way as that of males, but the orientation does not.

Habitat

Before European settlement, Stitchbirds occurred throughout the North Island mainland, as well as on Great Barrier Island and Little Barrier Island, both in the outer Hauraki Gulf, and on Kapiti Island, off the south-western coast of the North Island. There is no evidence that the species ever occurred on the South Island. Towards the end of the nineteenth century, however, the species had become extinct except for a small population that survived on Little Barrier Island (see Status and Conservation).

The habitat of the Stitchbird on the North Island was dense, moist broadleaf evergreen forest, and the mature forests of Little Barrier Island where the species has managed to persist are believed to be similar to the undisturbed mainland habitats which it formerly used. The forest habitat of Little Barrier is among the most pristine in New Zealand, with negligible human impact over most of the island for some 150 years and in some areas no evidence of human impact at all.

Little Barrier Island is of volcanic origin, and has a series of central peaks that descend steeply to the coast in radiating gorges, ravines and valleys. The highest peak is Mount Hauturu, at 722 m, and the island is often capped by cloud. The combination of altitude and topography of the island produces a range of distinct forest types, each with a different suite of plant species. At least 14 vegetation communities have been recognized here.

Detailed studies on Little Barrier Island, by G. R. Angehr, showed that Stitchbirds inhabited mainly dense, moist hardwood forests but moved extensively between forest communities in order to exploit seasonal flowering or fruiting within communities, and ranged from the lowest valleys up to the ridges of the mountain summits. They appeared to prefer mixed forests dominated by tawa (*Beilschmiedia tawa*) and northern rata (*Metrosideros robusta*) in the valleys and on the lower slopes up to 300 m, where tairę (*Beilschmiedia tarairi*), kohekohe (*Dysoxylum spectabile*) and puriri (*Vitex lucens*) are also present, and forests dominated by tawa and towai (*Weinmannia silvicola*) on steep slopes at altitudes above 500 m. Stitchbirds were recorded less often in mixed forest of kauri (*Agathis australis*) and hard beech (*Nothofagus truncata*) on ridges at middle elevations, in tall regenerating forest of kanuka (*Leptospermum ericoides*) in the valleys, in wet forests dominated by tawa, towai, tawari (*Ixerba brexioides*) and miro (*Prumnopitys ferruginea*) on ridges above 400 m, and in coastal pohutukawa (*Metrosideros excelsa*) forest. They were least common in *Leptospermum* forests growing on the ridges and in stunted summit forests of *Quintinia*, tawari and southern rata (*Metrosideros umbellata*) on the highest peaks. Stitchbirds occasionally visited the garden of the single homestead on Little Barrier, where they foraged on cultivated fruits.

It is possible that *Nothofagus* beech forests represented a marginal habitat for the Stitchbird on the main North Island, as well.

All of the islands to which Stitchbirds have been translocated (see Status and Conservation) have been significantly modified from their natural state through clearing and burning and associated agricultural activities of Maori people and Europeans, and by the browsing and grazing of introduced stock, such as sheep and goats, or pest species, such as common brushtail possums (*Trichosurus vulpecula*). Compared with Little Barrier Island, all of them have a lower diversity of fruit and nectar resources, this being especially so in winter. Furthermore, as there is little or no mature vegetation, there is a shortage of natural tree cavities suitable for breeding. This, too, may continue to limit the numbers of Stitchbirds on these islands, although the provision of artificial nesting boxes can go some way towards remedying this problem. The habitats of these islands are all being managed so as to restore the native vegetation and the stock of fruit-bearing and nectar-producing plants that Stitchbirds need for their survival.

General Habits

The Stitchbird is a diurnal and largely arboreal species, although it does occasionally forage on the ground, and copulation and some displays are also performed on the ground. It is usually confiding and approachable, and quite vocal, with contact calls and some other vocalizations given throughout the year. Nevertheless, it is quieter in the non-breeding season than when breeding, and it may be harder to detect at this time (see Voice).

One of the species' more characteristic habits is its frequent cocking of the tail, to 90 degrees or a little beyond, which is typically done when it alights on a branch, and is a feature also of some displays. When alarmed or excited, the male cocks his tail and will raise the nape-tufts. In a resting posture, the tail is often cocked but the wings hang down beside the body. Stitchbirds are highly mobile and are agile and acrobatic when foraging, often hanging upside-down when searching for food or in order to reach flowers or fruit. Despite being a normally able flyer, this species appears to cross open habitats only rarely and does not usually, if ever, cross water.

In general, Stitchbirds are seen in pairs or in small groups of up to ten individuals, and they often associate with Tuis and New Zealand Bellbirds, particularly in flowering or fruiting plants. During the breeding season, which coincides with the austral spring and summer, October–March, the male Stitchbird defends a small territory of some 30–50 m around the nest-site in which it is aggressive towards and chases other males, while the female defends the nesting cavity by exhibiting aggression towards any other birds, including other Stitchbirds and even, at times, her



*The much less colourful female **Stitchbird** is significantly smaller than the male, and weighs some 20% less at around 30 g. Both sexes have prominent black bristles around the base of the bill. The wings are broad and rounded, with ten primaries and nine secondaries. The tail, consisting of twelve rectrices, is long and square-cut at the tip; it is frequently cocked, for example when the bird alights on a branch, and during displays. Remarkably, male Stitchbirds have one of the largest cloacal protuberances of any bird species. Its volume increases four-fold between the non-breeding and breeding seasons, as indeed does the female's. But the male's also changes its orientation, from posterior-facing to almost perpendicular to the abdomen, facilitating face-to-face copulation. The Stitchbird is the only species of bird known to copulate in this way, though it also copulates in the normal avian fashion.*

[*Notiomystis cincta*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Neil Fitzgerald]

own mate, that land near it. Nevertheless, during the breeding season, group size varies with the mating system of individuals (see Breeding), and groups of Stitchbirds can cluster around nest-sites and may still congregate at feeding sites.

Once they have fledged, from about December, the juveniles, accompanied by their male parents, join crèches (see Breeding). These crèches begin to disband in the autumn. In the non-breeding period, in the austral autumn and winter, Stitchbirds are often seen to congregate in small groups, again of up to about ten individuals, but typically of two to six. At this time, they are often found also in mixed-species foraging flocks with Whiteheads (*Mohoua albicilla*), North Island Saddlebacks (*Philesturnus rufusater*) and other passerines. In mid-winter on Little Barrier Island, Stitchbirds were as likely to be found in a mixed-species flock as not to be.

Stitchbirds form dominance hierarchies, with older birds typically dominant over younger ones, especially those of the same sex, and males dominant over females. The individual's position in such hierarchies, however, can vary with mating and residential status; for example, on Little Barrier Island, females are dominant over males when chicks are present in the nesting cavity. Dominance hierarchies usually form also within polygynous and polyandrous groups (see Breeding), which generally contain a dominant male or a dominant female or both.

Stitchbirds call in alarm, using different vocalizations for different levels of threat or apparent threat (see Voice), and in such situations they may raise the nape-tufts and cock the tail. It has been said also, however, that the female sometimes simply hides quietly. Stitchbirds often mob predators, including the Morepork (*Ninox novaeseelandiae*) and cuckoos (Cuculidae), although there are no published reports of Stitchbirds suffering brood parasitism by cuckoos. During mobbing, the alarm calls of one or more birds often attract others.

Little is known about the roosting habits of this species. Stitchbirds roost at night, in small groups of several individuals, and typically in tree cavities. They have been seen to roost also in clumps of *Collospermum*, in foliage or in dense lianas, and among rocks in rocky outcrops.

There has been little study of overall time-budgets of the species. During the first two weeks following the translocation of Stitchbirds to Mokoia Island (see Status and Conservation), the birds spent 70% of their time foraging, with 34% of the time feeding on nectar and fruit and 36% on invertebrates; of the remaining 30% of their time, 29% was spent in perching and 1% in other activities. Whether the behaviour of a long-established population would differ is not known, but it seems probable that it would.

Voice

The vocalizations of the Stitchbird are quite well known, and consist of a wide range of often high-pitched sounds. Both sexes call, although most of the vocalizations of males are considerably louder than those of females and are, therefore, much more readily heard; most female vocalizations are not audible beyond a few metres. Some calls, such as those used for warning and for contact, are given commonly, and throughout the year, but this species is much noisier during the breeding season. Stitchbirds vocalize least in mid-winter, although they do call at regular intervals when foraging. Seven vocalizations are unique to males, five are given only by females, and at least a further eight vocalizations are shared by the two sexes.

The frequently heard "Warning Call" is a "titch" note, this being the origin of the species' English vernacular name. The Maori name Hihi is another interpretation of the call. Such "titch"

notes can be given singly or, with increasing levels of alarm, uttered in an accelerating series, when the warning call may grade into the "Alarm Call", a series of high-pitched "yeng" notes. Other calls emitted by both males and females include a plaintive "wee" or "tseet", given singly or in pairs, which is the "Contact Call", and a soft warble, inaudible beyond a few metres, which may include mimicry of other bird species such as the New Zealand Robin (*Petroica australis*) and the North Island Saddleback. The "Aggressive Chat", somewhat similar to the warble, is given in threat (see Breeding), and a "Chase Call", consisting of rapid "pew" syllables, is uttered by an individual when it is being chased by others. A series of soft, short squeaks is sometimes heard to be emitted by individuals which are inspecting nest-cavities other than their own, and this call is uttered also by males when they are being pursued by other males. Both parents make brief high-pitched calls, known as "Parental Calls", in order to induce fledglings to move.

Male song is a loud and high-pitched whistle of two or three notes, "wee-ah-wee", "wee-ah" or "trr-ah-wee", with several variants included in a single song bout. This song, which can be given at rates of up to 120 per hour, is heard frequently during the breeding season, especially at the beginning of the season. On Kapiti Island, where there is a shortage of nest-sites, males sing throughout the year, although at higher intensity at the start of the breeding season. Other male vocalizations include the "Nest Call", "chi-ching", which is usually interspersed with song; the "Identification Chat", given whenever the male meets with its mate and comprising squeaky warbling sounds; a plaintive "Copulation Cooing"; a soft "Threat Cooing", given during the Ultimate Aggressive Display (see Breeding); and a "Metallic Call", delivered during display-flights. A quiet "pew" was once heard from a male during copulation.

Vocalizations given only by female Stitchbirds include several calls associated with copulation. Both a repeated loud plaintive "pew", the "Copulation Request Call", and a loud high-pitched warble, the "Copulation Request Warble", are given by females seeking copulation, the warble often following the copulation request call. Females also utter a rapidly repeated loud "pew", known as the "Forced Copulation Call", when being chased by males attempting forced copulation and during forced copulation itself (see Breeding). As well as these vocalizations, the female emits a short, soft, high-pitched "sweet" as an identification call from inside the nest-cavity in reply to the song of the male on his arrival at the nest; she also directs hisses towards her mate in aggression.

On Mokoia Island, novel songs were heard each year, suggesting that new songs are created regularly. Some of these songs become prevalent, which would appear to indicate that song is transmitted culturally among the Stitchbird population.

Food and Feeding

The diet of the Stitchbird consists of nectar, fruit and small invertebrates, the proportions of which vary throughout the year, largely reflecting their availability in the environment. In this regard, the diet is similar to that of many honeyeaters, and represents another convergent aspect of the species' ecology and biology that led to the Stitchbird's long treatment as a meliphagid. A habit which the Stitchbird shares with many honeyeaters is that of eating primary or secondary plant exudates that are rich in sugar or other carbohydrates, such as lerp, manna and honeydew, although the significance of these in the diet is not known as they have not been quantitatively analysed.

Stitchbirds visit a wide variety of plants in their search for food, and seasonal patterns in the use of plant species through the year are evident. Important sources of nectar include the sugar-rich flowers of *Metrosideros*; these resemble the flowers of eucalypts (*Eucalyptus*) and *Syzygium*, which are widespread in Australia and New Guinea, and all of these are members of the family Myrtaceae. *Knightia* is another main source of nectar and a member of the Proteaceae, another family of nectar-rich plants widespread in Australia. Other important nectar-producing plants that feature in the diet of the Stitchbird include the puriri, a small verbenaceous tree with scattered but nectar-rich flowers, the horopito (*Alseuosmia macrophylla*), a caprifoliaceous shrub with large crimson flowers (and berries), the lily-like New Zealand flax (*Phormium tenax*) and the cabbage tree (*Cordyline australis*). Major fruiting plants used by the Stitchbird include those of the genera *Coprosma*, *Pittosporum*, *Pseudopanax* and *Aristotelia*, of the respective families Rubiaceae, Pittosporaceae, Araliaceae and Elaeocarpaceae. These four provide both abundant nectar and fruit, as also do species of *Metrosideros*, *Fuchsia* and *Rubus*.

In studies on Little Barrier Island, important foods were found to include nectar and fruit of *Coprosma*, the fruits of which accounted for 40% of observations of feeding in one study, and nectar, and some fruits, of the haekaro (*Pittosporum umbellatum*). Equally significant was the nectar of *Metrosideros*, mainly of the pohutukawa, or "New Zealand christmas tree", which accounted for 42% of observations of nectar-feeding in one study, and of the northern rata, but also that of the scarlet rata (*Metrosideros fulgens*), the white climbing rata (*Metrosideros perforata*), the horopito, *Rhabdothamnus solandri* of the family Gesneriaceae, the puriri, and the rewarewa or "New Zealand honeysuckle" (*Knightia excelsa*).

The fruit and nectar of most of these plants are available for only part of the year. In one study on Little Barrier Island, for example, the major nectar sources over the year were the puriri in May, July, September and November, the haekaro in August–September, *Alseuosmia macrophylla* in August–October, *Knightia excelsa* in September–October, the pohutukawa in December, and the northern rata in December–January. Studies on the two islands of Kapiti and Mokoia revealed much annual variation in the timing and production of flowers and fruit, and that shortages of food may be a limiting factor in some years, particularly on the highly modified islands to which Stitchbirds have been translocated (see Status and Conservation).

On Little Barrier Island, Stitchbirds occasionally foraged in the garden of the single homestead on the island. Here, they fed from orange blossom, and took figs (*Ficus*) and the berries of houpara (*Pseudopanax lessonii*) and mahoe (*Melicytus ramiflorus*).

Small invertebrates are a further important source of food and protein throughout the year, although there are few records of precisely which species Stitchbirds consume. Insects, including beetles (Coleoptera), and spiders (Araneae) are the only items reported in the literature. Nevertheless, insects have been found to form the major component of the diet in some seasons for the natural population of Little Barrier Island and for the translocated populations studied. In addition, Stitchbirds may ingest significant amounts of pollen, but it is likely to pass through the gut largely undigested, as is the case also with the honeyeaters.

The total proportions of nectar, fruit and invertebrates in the diet vary not only seasonally, but also between the natural populations of Stitchbirds on Little Barrier Island and the translocated populations elsewhere. Moreover, there are variations within populations in the findings of different studies in which relevant data have been gathered, although these may reflect annual variation in flowering and fruiting phenology. As an example, in one study on Little Barrier Island, it was found that nectar-feeding comprised 69% of foraging observations over the year, fruit accounting for 15% and invertebrates for 16%; comparable results from a second study, albeit one with a larger sample size, were nectar 30%, fruit 31% and insects 39%. In studies of the translocated population on Kapiti Island, over the year, feeding on nectar formed 37% of observations of foraging, whereas the taking of fruit represented 23% and the eating of invertebrates 40%.

Likewise, seasonal patterns in the proportions of the three major components of the diet exhibit much variation. For example, in one study on Little Barrier Island, nectar was the main dietary component in spring and summer, accounting for, respectively, 89% and 83% of foraging observations, and was a major component also in winter, with 47%; fruit was the main component in autumn, when it figured in 50% of observations, while insects formed a maximum of 29% of observations in autumn and winter. In contrast, in a second study on Little Barrier, nectar was the main component of the diet in spring and winter, with respectively 56% and 51% of feeding observations; fruit was the

The common call of both sexes is a warning "titch", which is the origin of the vernacular English name, ***Stitchbird****. The Maori name, Hihi, is apparently another rendering of this call. The calls of the male are louder than those of the female, which are generally not audible beyond a few metres away. The male's song is a loud, high-pitched whistle of two or three notes, with several variants included in a single song bout. The song can be given at a rate of about 120 bouts per hour. The male advertises his territory by singing from within it, or at feeding areas. His persistent singing reaches its greatest intensity in the two days before the female lays, but stops almost entirely after laying. However, on Kapiti Island, where nest-sites are in short supply, males sing throughout the year. On Mokoia Island, novel songs were heard each year, suggesting that new songs are created regularly. Some of these songs become prevalent, which appears to indicate that song is transmitted culturally among the Stitchbird population. The male has seven identifiable vocalizations, and the female five. The male's calls include: the "Identification Chat", a series of squeaky and warbling sounds given at meeting with his mate; a plaintive "Copulation Cooing"; a metallic call given during display flights; and a soft "Threat Cooing" directed towards intruding males. The female's repertoire includes: the "Copulation Request" call and warble; a soft, high-pitched "sweet" given as an identification call from the nesting cavity in reply to her mate; and an aggressive hiss. Females also utter a rapidly repeated "Forced Copulation Call", when pursued or during forced copulation. At least eight further calls, including the "titch" call, and brief high-pitched calls used to induce fledglings to move, are shared by both sexes.*



[*Notiomystis cincta*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Martin Grimm]



*The proportions of nectar, fruit and invertebrates in the diet of the **Stitchbird** vary throughout the seasons, from island to island, and from year to year, reflecting their availability. The brush-tipped tongue has its edge curled to form a tube, and nectar is taken by probing flowers with the curved bill. Stitchbirds visit the plants which offer the most nectar, and tend to avoid those which are comparatively low in nectar. But each of these plants flowers for only part of the year, and though different species may offer nectar in succession, studies of the Stitchbird population on Little Barrier Island found that none of the major nectar sources are available between January and May.*

[*Notiomystis cincta*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Martin Grimm]

main component in autumn, with 89%, and was significant also in spring and winter, with 33% and 40% respectively; and insects were the most important component in summer, when they featured in 70% of foraging observations.

The seasonal pattern observed for the translocated Stitchbird population on Kapiti Island was different again. Nectar was the main component of the diet in winter, recorded in 73% of feeding observations, and nectar, insects and fruit formed equal proportions of the diet in autumn, each with 33% of observations; fruit, accounting for 46%, and insects, for 45%, were the main dietary items in summer, and insects formed the main component of the diet, 71%, in spring. On Mokoia Island, Stitchbirds fed mostly on nectar and fruit in winter and spring, and mostly on invertebrates in summer and autumn. Foraging for nectar comprised the main proportion of foraging time during spring and winter, 75% and 54% respectively, and invertebrates the principal component in summer and autumn, 73% and 51%; fruit was the target in a maximum of 28% and 27% of foraging time in autumn and winter, respectively.

The results of these various studies show that seasonal patterns in the consumption of nectar, fruit and insects vary both within and among islands, with no constant trends evident. It is likely, however, that the differences in the patterns of exploitation of nectar, fruit and insects are a result mainly of the differences in the floristic composition among populations, or islands, and both regional and annual variation in flowering and fruiting phenology. There may also be some effect, in part confounded by the previous factors, of competition with other birds that varies with the differing avian communities associated with each population.

On Mokoia Island, the plant species most frequently exploited for nectar tended to be those that contributed the greatest proportion of nectar in the standing crop at any one time, and the birds tended to avoid flowers that were comparatively low in nectar. This is likely to apply to other populations. In contrast, the proportion of time spent in feeding on different species of fruit bore little relation to the store of carbohydrates available in the fruits at the time.

Stitchbirds are primarily arboreal, and are agile and acrobatic when foraging in trees and shrubs. They forage actively among the foliage, twigs and terminal shoots of trees and small shrubs, often hanging upside-down in order to reach flowers and fruit and to capture invertebrates. Within trees they move from inflorescence to inflorescence by walking and clambering along branches, by jumping or making short glides; they will also spring into the air from branches to catch insects, sometimes alighting on a different branch.

On Little Barrier Island, Stitchbirds carried out most of their foraging in the middle and lower levels of the understorey, which accounted for, respectively, 27% and 29% of recorded observations, although they foraged much also in the subcanopy and in the canopy, each of which featured in 17·8% of observations. Only very rarely do they descend to the ground, but females have been seen to feed on beetles on the forest floor, and also to follow a Kaka (*Nestor meridionalis*) and catch insects disturbed by the parrot as it carved away at bark.

This species gathers nectar by directly probing flowers, and it obtains fruits by plucking them from plants. It gleans invertebrates from bark and foliage, from inside hollows and other cavities in trees, and also by probing beneath bark, and it will also make aerial sallies to catch flying insects or to pluck invertebrates from spider webs. It obtains insect and plant exudates by gleaning from foliage, twigs and shoots.

All of the important sources of nectar and fruit for Stitchbirds are commonly exploited also by the two New Zealand honeyeaters, namely the Tui and the New Zealand Bellbird. These three species, treated together as honeyeaters (see Systematics) in all existing studies of their food and feeding, partition nectar resources according to richness. When foraging together, they sometimes develop dominance hierarchies, in which Tuis and Bellbirds are dominant over Stitchbirds. The Tui, much the largest of the three, feeds on rich flowers in trees and large shrubs, which it defends. The Stitchbird is subordinate to the Tui, and may feed on peripheral flowers of the rich sources, but it tends to visit poor nectar-producers or those with dispersed flowers. The New Zealand Bellbird, in its choice of flowers, occupies a niche between these two species. All three may switch to the eating of many insects or fruits at different times of the year.

Breeding

The breeding biology of the Stitchbird is perhaps the most obvious behavioural difference between this unique species and the

honeyeater family, Meliphagidae, within which the Stitchbird was previously placed (see Systematics). Some of the most noticeable characteristics separating it from the meliphagids are its cavity-nesting habit, its typically larger clutch size, its complex and varying mating system and, uniquely among birds, its face-to-face copulation. Further, male Stitchbirds exhibit a number of morphological features found in species with highly variable mating systems and in situations when males are under intense sperm competition: they have large testes, very large numbers of sperm in their seminal glomera, and an unusually enlarged cloacal protuberance.

The species' breeding season is centred on the austral summer, with nesting recorded from September/October to February/March, although, within local populations, breeding is not synchronous and nests at various stages are recorded throughout this period. The first eggs are usually laid by mid-October, but annual variation is apparent; in two seasons on Kapiti Island, for example, first clutches were laid between 16th November and 9th December in one season and during 5th–19th December in the next. Stitchbirds begin to investigate cavities as early as August, and male displays and vocalizing begin or increase in September, before the start of nest construction and egg-laying. This species may make two or even three or four breeding attempts in a season. On Mokoia Island, females lay one to three clutches per season, although third clutches are usually laid only if second clutches fail, and second clutches do, indeed, tend to be unsuccessful. On Tiritiri Matangi Island, females can lay up to four clutches if early nesting attempts fail, but they succeed in raising only one or two broods in a season.

The displays of Stitchbirds are reasonably well known. In September–October, at the start of the breeding season, the male advertises ownership of his territory by singing persistently from within it or at feeding areas. This persistent singing continues until the time of laying, reaching its greatest intensity in the two days before the female lays, but it stops almost entirely after laying. This territorial advertising and singing probably have some function in courtship and sexual behaviour. At the nest-site, the male performs a display-flight to the female in which he glides slowly downwards from the entrance to the nest-cavity, the spread wings displaying the yellow and white colours, and the nape-tufts held raised, during which he utters a metallic call. He alights near the female, either landing on the ground or flying upwards to perch on a higher branch. Males also court females by "display-walking" on the ground, the wingtips crossed over the back and the nape-tufts raised, and uttering the warbling call. The walking display often precedes copulation. The male gives the Identification Chat each time he and his partner meet; the female within the nest gives the Identification Call after her mate sings on arrival at the site (see Voice).

Throughout the breeding season, Stitchbirds are aggressive towards conspecifics, both males and females performing threat displays. These nearly always culminate in aerial chases, which are sometimes accompanied by Chase Calls. The uttering of the Aggressive Chat is the first indication of threat, and this is followed by an "Aggressive Display" in which the bird, male or female, leans forward while holding the tail cocked vertically, the wings raised at the shoulders and the wingtips crossed over the back, and the nape-tufts raised. On occasions, individuals move the body from side to side while displaying. The Stitchbird will stop displaying whenever the antagonist moves away. Male aggressive displays are usually directed towards other Stitchbirds, such as subordinate males which are feeding nearby, or males that approach the nest-site, the young or the mate too closely. Females direct their aggressive displays mostly at other females or at juveniles, and rarely at their mate near the nest.

In extreme situations, both males and females perform an Ultimate Aggressive Display, which differs between the sexes. The female spreads her wings and moves decisively towards any bird, including her mate, near the nest, and hisses; she may also vibrate her wings. In the corresponding display of the male, the latter points his bill skywards, holding the wings spread and vibrating slightly and the nape-tufts raised, and emits low "coo" calls. The male's displays always result in chases, and usually follow repeated aggressive displays and chases when an intruding male does not leave the nest-site.

In the breeding season, threats occasionally escalate into fights if an antagonist does not leave, the two birds then grappling with their feet while pecking at one another. Such fights often start in the air, the combatants then dropping to the ground. Supposed fighting within the nest-cavity is now known to involve forced copulations. In addition, females have been seen to attack their mates near the nest, employing the bill, wings and claws for this purpose.

In response to aggression, a submissive Stitchbird sits quietly, with the plumage sleeked and the tail held downwards, and looks away from the displaying individual. Further, when it is



Foraging ***Stitchbirds*** *move from flower to flower by walking along branches, jumping, and making short glides. They hang upside-down to reach flowers and fruit, or capture invertebrates. They glean invertebrates from bark and foliage, probing into crevices and under bark. They also spring into the air to catch insects. Stitchbirds will travel several kilometres daily between feeding sites, and to visit artificial feeders. They forage in pairs, or in groups of up to ten outside the breeding season. They also join mixed flocks, often including the endemic honeyeaters Tui* (Prosthemadera novaeseelandiae) *and New Zealand Bellbird* (Anthornis melanura).

[*Notiomystis cincta*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Peter Fuller]

intruding into the territory or nest-site of another, or when a fertile female meets any male, including her own mate, the individual often freezes, and resident males appear to ignore or not to notice the still bird. In such circumstances, the intruder or the female may be able to leave the area without being threatened or attacked; if it is noticed, however, it is attacked. One female froze as if dead, closing her eyes while lying on her side on the nest-platform.

Of great interest is the mating system of the Stitchbird, which varies from social monogamy to polyandry, polygyny or polygynandry. The frequency of monogamous or polygamous breeding varies between the natural population of Little Barrier Island and translocated populations, but social monogamy is the most common system. There is variation also in the duration of the pair-bond, some individuals staying with the same mate for years, while others change partners between breeding attempts within a single season.

Regardless of the mating system involved, extra-pair copulations are common on Little Barrier and other islands. Males tend to have a strategy whereby they combine defence of a nesting site with one or more females while seeking extra-pair copulations, which occur frequently and most of which are forced (see below). Unpaired males are frequently responsible for extra-pair copulations. On Mokoia Island, it was found that 46% of 188 nestlings were the offspring of extra-pair males, and 82% of 56 broods contained at least one extra-pair nestling; of the extra-pair young, 34% were the offspring of unpaired males and the rest were sired by paired males. On Tiritiri Matangi Island, 35% of 34 nestlings were from extra-pair copulations and eight of the ten nests studied each contained at least one extra-pair young; about half of the extra-pair young were offspring of unpaired males. Further studies have shown that the level of parental care given by a male Stitchbird is linked with a number of factors, particularly the number of chicks in a brood. Males did not contribute to the feeding of broods of one, but they usually contributed to the rearing of broods of more than one, the male's effort increasing with the size of the brood.

Female Stitchbirds, during the three weeks before laying, increase their body weight by an average of 31%, from a mean of 31 g at the start to a peak weight of about 41 g two days before the first egg is laid. The males are able to determine, accurately, the fertile status of females mainly by this increase in weight, which is likely to be evaluated through changes in the female's flight. As a female's weight increases, the level of mate-guarding by her partner and attempted extra-pair copulations likewise rise.

On Little Barrier Island, Stitchbirds appear to be largely socially monogamous, but there is some variation, both polyandry and polygyny apparently occurring. In contrast to the situation on Little Barrier, in translocated populations on the islands of Kapiti and Tiritiri Matangi, and formerly on Cuvier and Mokoia Islands, where breeding density may be limited by a shortage of suitable nesting holes, the mating system varies greatly. Of 34 nests on Kapiti Island, 65% were considered to involve monogamous pairings, 12% polygynous males, 9% polyandrous females, and 3% polygynandrous individuals, and some individuals bred in more than one form of mating system, usually with different partners. Some males guarded the mate closely during the latter's fertile period, attempting to restrict the female's opportunities for extra-pair copulations, but other males did not spend much time with one female during the period from before laying to the end of incubation. On Tiritiri Matangi Island, most males were socially monogamous but some were polygynous, with usually two, and sometimes three, females in the territory of the male. On this island, during the female's fertile period, the male was more likely to be close to his mate and increased his contact with her, switched from site-specific territorial defence to defence of an area centred on his partner, and more often followed the female to communal feeding sites outside the territory. For polygynous males, these various aspects of behaviour were related to whichever of his females was fertile.

Stitchbirds copulate in two positions. They use the conventional avian method, in which the male mounts the female from behind, and also, uniquely among birds, a face-to-face position. The latter, however, is virtually restricted to forced copulations, which can occur often in most populations. Of 105 copulations observed on Tiritiri Matangi Island, half were within-pair and unforced conventional copulations, a further 27% were extra-pair and forced face-to-face copulations, and most of the rest were extra-pair conventional avian copulations, either with (10%) or without (7%) some resistance by the female. The remaining half-dozen were face-to-face copulations without apparent resistance by the female.

Normal copulation usually takes place in the mornings and late afternoons, and in the period of about nine days between the completion of the nest and the completion of the clutch, but it can start up to 17 days before laying. Display-walking by the male is often a prelude to copulation, and a female may solicit copulation by moving about while holding the feathers of the head raised, the wings crossed over her back and vibrating rapidly, and calling loudly with the copulation request call or warble (see Voice), although such female displays do not always lead to copulation. In conventional copulation, the paired male and female display, using the same posture as that of the soliciting female and emitting calls. The male then moves on to the back of the female, often mounting several times, the birds rubbing necks and touching bills before and after each copulation. This action usually takes place on the ground and within about 20 m of the nest, and only rarely is it performed on branches. Nevertheless, Stitchbirds sometimes copulate inside the nest-cavity or at foraging sites away from the nest. The act of copulation lasts for 6–30 seconds, after which the male often display-walks and sings as he moves away. The female returns to the nest, or preens or flies away with the male.

During forced copulation, a female is chased to the ground by a male, usually not her mate, which then mounts her while holding her on her back so that the two birds are face to face. The female often spreads her wings or kicks at the male, as though trying to escape, and the male also spreads his wings or points his bill upwards and extends his wings a little. After copulation, both birds fly away, separately. A female may be forced to the ground several times before copulation takes place. Repeated uttering of the forced copulation call (see Voice) by the female as she is being chased, and sometimes during copulation, can attract other males or, if the copulating male is an intruder, the female's partner, which may interrupt the act. Most forced copulations begin with the chasing of a female by a single male, but up to four more males can join in, although only the first male copulates, the others watching from within a metre and calling. The duration of forced copulations varies from 6–8 seconds to more than a minute. A male may force copulation on his mate if there are many other males in the nesting area.

Nests of Stitchbirds are almost always built in a hollow or other cavity in the trunk or branch of a mature and living tree, but dead trees are also used. On Little Barrier Island, the species commonly nests in puriri and pohutukawa, as well as in tawa and taraire, and on Kapiti Island it often utilises pukatea (*Laurelia novae-zelandiae*), rata, hinau (*Elaeocarpus dentatus*) and kamahi (*Weinmannia racemosa*) trees. Individuals recently released on the North Island mainland at Cascade Kauri Park, in Auckland, have been found to nest in kauri trees. Occasionally, pairs of this species nest in cavities among rocks in rocky outcrops, and in 1948 one pair nested in the hollow created by a kingfisher (Alcedinidae). On Tiritiri Matangi Island, Stitchbirds use artificial nestboxes, as they did formerly on Mokoia Island. On Little Barrier Island, nests have been recorded from about 1 m to 18·5 m above the ground. The mean height of nine nests over three years was 6·25 m, ranging from 1 m to 10 m. The entrances to three nests measured 4–4·5 × 4–8 cm, and that of another was 8 × 10 cm. The female will usually, if possible, begin to build in several cavities before selecting one in which to nest. On Little Barrier Island, Stitchbirds have nested without aggression close to breeding sites of the Rifleman (*Acanthisitta chloris*) and the Red-fronted Parakeet (*Cyanoramphus novaezelandiae*), both of which are hole-nesters, although on Kapiti Island there was much aggression between Stitchbirds and parakeets at nesting sites.

On Little Barrier Island, the breeding density is not limited by availability of suitable nesting holes, and the minimum dis-



Although primarily arboreal, ***Stitchbirds*** *will sometimes feed on the ground. This bird is picking up berries which have been knocked down by other feeding birds. The berries are those of* Coprosma, *a genus providing a major source of fruit and nectar for Stitchbirds;* Coprosma *berries accounted for 40% of observations of feeding in one study on Little Barrier Island. Female Stitchbirds have been seen feeding on beetles on the forest floor, and also following and catching insects disturbed by a Kaka* (Nestor meridionalis).

[*Notiomystis cincta*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Tui de Roy/ Roving Tortoise Photos]

tance between nests was about 100 m, with eight nests found in an area of approximately 20 ha. On Kapiti, the minimum internest distance was 110 m and the maximum 1620 m. On the other hand, on islands to which the species has been moved and where there are insufficient nesting sites, including Kapiti Island, up to three females have been seen to build in the same cavity, and two females have been known to share a cavity on Kapiti, and to share nestboxes on Mokoia and Tiritiri Matangi.

The nests that are built within the cavity consist of a platform of sticks and, in some cases, rootlets, supporting a cup made from fern rhizomes and bound together with spider web, and lined with scales from ferns and tree-ferns (*Dicksonia*, *Cyathea*) and feathers. The platform is typically some 15–20 cm deep, but one had a depth of 40 cm. The nests are usually level with or slightly above the entrance hole to the cavity. Nests are almost invariably built by the female, although males often take sticks inside cavities at the start of the breeding season, and there are a couple of instances of males building on Mokoia and Tiritiri Matangi Islands. On occasions when there are 2–4 females at one nest-site at the start of the season, all of these help to build the nest platform, but normally only the dominant female builds the nest-cup and only one remains in the area and stays with the nest. During the constructing of the nest, material is usually gathered within 10 m of the site and the work of building takes place at any time of the day. When the platform is being built, it is not uncommon for many sticks to be dropped, and these can pile up below the entrance to the cavity. Construction of a nest can take as little as three days, but usually takes up to two weeks, and material may still be added after the eggs have been laid.

The reuse of nesting sites appears to vary between Little Barrier Island and the islands to which Stitchbirds have been translocated. On Little Barrier, where there appears to be no shortage of suitable nesting sites, none of nine nests studied over a three-year period was reused for a second clutch in the same season, and only one nest was reused by the same pair in a subsequent season; another was reused, but by a different pair. In contrast, on Tiritiri Matangi Island, both males and females usually returned to the same nesting sites annually, and 89% of all returning females nested in the same territory, while on Kapiti Island the same cavities were used from year to year, and for both first and second clutches, although some pairs nested away from their sites of previous years.

On Kapiti Island, the average period between completion of the nest and the start of laying was 9·6 days, with a range of 1–23 days. The usual clutch consists of three to five eggs, but clutches sometimes contain as few as two eggs, and some of six eggs, presumably laid by the same female, have been reported; second clutches in a season usually contain one egg less than the first clutch. The mean clutch size on Tiritiri Matangi was 4·07 eggs. Eggs are normally laid on consecutive days, and in the morning, although laying is progressively about an hour later each morning, so that first eggs are laid between 06:30 and 07:00 hours and last eggs between 11:00 and 12:00 hours. On Tiritiri Matangi Island, in 13·5% of clutches laying was interrupted, with an interval of two days between eggs. The gaps correlated with territorial intrusions by extra-pair males in the days before laying, suggesting that harassment of the female, which involves resisted forced copulation, alters normal foraging behaviour and the process of egg-formation. While laying, the female stays in the nest-cavity for a mean of 1·4 hours.

The eggs of the Stitchbird are ovoid, and smooth and glossy. The colour varies from typically pure white without markings to pale yellowish-white with dense spotting and clouding of pale rufous-brown. Surprisingly, there are few data on the dimensions of the eggs. The length and breadth of three eggs were 21·3–21·8 × 16·7–16·8 mm, with a mean of 21·6 × 16·7 mm, which is larger than the 19 × 15·4 mm given by Oliver, and which he considered small for the size of the bird. The average weight of 26 eggs was 3·1 g. The female usually covers the eggs soon after laying with up to 2 cm of additional moss or tree-fern scales gathered from the area around the nest, fresh material being gathered daily and earlier covering incorporated into the nest lining. On Tiritiri Matangi, all females covered their first eggs and nearly half covered all except the final egg, when incubation began.

Incubation is by the female alone, and begins on the day when the clutch is completed, although some females partly incubate after the third egg has been laid. On Mokoia Island, the average length of an incubation stint by a female was just under 15 minutes, ranging from no more than about 9 minutes to about 24 minutes; the duration of absences from the nest ranged from about 3 minutes to approximately 7·5 minutes, with an average of 4 minutes 20 seconds. The average incubation period on Mokoia was 15·75 days, ranging from 13 to 19 days.

Young Stitchbirds are altricial and nidicolous. The state of the young at hatching is not properly known; they are blind, and either naked or almost so. The chicks quickly develop a light covering of down, one three-day-old individual having tufts of light grey down distributed sparsely over its head, back and lower

flanks. By the time they fledge, the young are in complete or almost complete juvenile plumage. Females undertake most or all of the brooding of the nestlings, although males sometimes assist. There are no published data on the amount of daily time spent in brooding or on whether brooding time decreases over the course of the nestling period.

Both members of the pair feed the chicks. The female, however, does considerably more feeding than the male, and in monogamous pairs the females were recorded as making three times as many visits to the nest per hour as the males. In some instances, the female contributes all of the brood-feeding. The begging call of nestlings is a loud "shh, shh, shh", audible for several metres from the nest-cavity, and given when an adult visits the nest. For the first 8–10 days, the young are fed almost wholly with small insects less than 3 mm long, and contrary to some reports that they are fed mainly or solely with nectar; thereafter, they are given a combination of nectar, fruit and larger insects. When demanding food, young nestlings stretch up towards the adult, hold the bill open and give the begging call, whereas older nestlings tend to crouch down, vibrating the wings and presenting the open bill. The adults feed them directly, by regurgitation. In experimental studies in which the effects of providing supplementary carotenoids to breeding adults and directly to nestlings were examined, it was found that nestlings had a more intense orange-yellow gape-flange and mouth colouring, which resulted in increased provisioning of the chicks by the adults. Despite the fact that both members of the pair remove faecal sacs, nests quickly become fouled and liquid often seeps from the nest-cavity. Young remain in the nest for some 26–32 days. On Mokoia Island, the average weight of chicks at hatching was 2·8 g. Some 3–4 days before fledging, this had increased to 43·8 g for males and 36·4 g for females, equivalent to 120% and 121% of the respective adult weights.

The contribution of each parent to the feeding of the fledglings, the rate at which fledglings are fed and for how long a period they are provisioned depend on whether the female makes a second breeding attempt soon after the first brood fledges. If no further attempt is made, the juveniles will be fed for up to two weeks by both parents, although most of the feeding is done by the female. If the female does attempt a second brood, however, she continues to feed the young of the first brood until the time when she begins incubation of the second clutch, while the male guards her. If the fledglings are no more than one week out of the nest when the female begins incubation of the second clutch, the male will feed them.

Whereas nestlings beg loudly, fledglings do so silently, with the bill open and the wings vibrating, while leaning towards a parent. Nevertheless, for the first two weeks after they fledge, juveniles persistently utter a high-pitched "pee-ping", possibly to maintain contact with the parents. They also give a chuckling call when they make physical contact with a parent or another fledgling. Another call given by juveniles is a persistent "sit, sit, sit...", which may be a feeding call or a contact call. Chicks also try to mimic the sounds of other bird species.

About one week after leaving the nest, the juveniles join a crèche, accompanied by adult males, although the young are not fed by their parents. Such crèches vary in size, and have been recorded from December to about March, when they begin to disband. Individuals often visit other crèches for a day or so, but they then return to their own. Crèches are thought to have an important function in social development.

Within the crèche, juveniles appear to play, indulging in both "follow-the-leader" and "pushing". In the latter game, one individual lands on a branch next to a line of other juveniles and then pushes until one of them hangs upside-down, the pushing then being repeated by other birds. Fledglings also harass each other and allopreen, and in crèches where nearby adults are actively copulating they perform mock copulations and neck-rubbing. Mock copulations take place on branches, not on the ground, and the young being mounted rolls on the branch until it is upside-down or flies away. Young Stitchbirds also rub their neck on branches and other vegetation.

There are few published observations of the parental defence of nests or young, or of the response of young to threats. Long-tailed Koels (*Eudynamys taitensis*) appear to elicit some response: a pair of Stitchbirds was seen to defend its nest and nestlings with vigour against this parasitic cuckoo, and another pair was watched as it mobbed a koel near its fledglings. Fledglings have been seen also to freeze in response to the koel, and on two occasions, when dived at by a Long-tailed Koel, they dropped from the branch on which they were perched and flew off close to the ground. A pair of Stitchbirds on Kapiti Island was seen to give alarm calls and attack a Weka (*Gallirallus australis*) that approached too close to the pair's fledglings, and a male responded to a human observer who approached a nest by raising its white nape-tufts and hopping about. Interestingly, while New Zealand Bellbirds often harass juvenile Stitchbirds, the adults rarely respond to this.

Over the course of three breeding seasons on Kapiti Island, the success for first clutches ranged from 1 to 2·3 fledglings per nest, whereas second clutches were far less successful, 80% of them failing. On Mokoia and Tiritiri Matangi, all breeding attempts in which two females have shared a nestbox, and both laid and incubated, have failed. Studies have revealed that the reproductive success of Stitchbirds increases during the first few years of life.

The causes of nesting failure are not well known. On Kapiti Island, there is much aggression between Stitchbirds and Red-fronted Parakeets around nest-sites, and in one instance interference from the parakeets may have led to the abandonment of the breeding attempt. Further, nesting cavities are sometimes taken over by parakeets a few days after the young Stitchbirds have left, which precludes the Stitchbirds from attempting a second clutch in that hollow. On Little Barrier Island, however, Stitchbirds nest near parakeets without any apparent aggression from the latter. The main natural predator of the Stitchbird is the Morepork, a nocturnal and crepuscular owl.

The sex ratio of the natural population on Little Barrier Island has not been quantified, but it is possibly male-biased. On both Kapiti and Mokoia Islands, where equal numbers of males and females were initially introduced, the sex ratio remained even for 2–3 years, before becoming female-biased on Kapiti and male-biased on Mokoia, the more numerous sex in each case outnumbering the other by two to one. The population on Tiritiri Matangi Island is strongly male-biased, with a ratio of 3:1, apparently because the survival of females after translocation is lower than that of males. The reasons for the changes in sex ratios in these translocated populations are not known.

Stitchbirds first form pairs in the breeding season after they fledge, usually when at least six months old. On Tiritiri Matangi Island, they breed for the first time at 4–16 months of age.

The longevity of this species is about seven years. Many individuals in translocated populations do not reach one year of age, which is less than the average lifespan on Little Barrier Island. On Tiritiri Matangi, Stitchbirds exhibit significant variation in reproductive performance with age, most increases in reproduction occurring between the first and second years and with a decline after the fourth year. The main influence on reproductive output was found to be the timing of breeding, those individuals that laid earlier being more likely to produce more clutches in a season, and this was the main difference between first-year birds and older ones, first-years tending to start laying later. A delay in establishment of territories by many first-year Stitchbirds also delayed breeding, and this reduced their reproductive output in comparison with that of other individuals.

Movements

Stitchbirds are sedentary, although they do undertake some short-distance movements in connection with foraging. The extent of these movements, however, is not entirely clear, but it is recorded that Stitchbirds can travel up to several kilometres in a day between preferred feeding sites or between artificial feeders.

On Little Barrier Island, individuals will move widely in response to local or seasonal flowering or fruiting of plants. Changes in the abundance of these birds indicate some movements or shifts between forest types and also altitudinally, between valleys, where the ranges appear to be centred, and slopes, ridges and summits.

*The mating system of the **Stitchbird** is highly complex. Social monogamy is commonest, but males will breed with more than one female, females with more than one male, and multiple males with multiple females. Extra-pair copulations are common. The nest, a platform of sticks supporting a cup of fern bound with spider's web, is usually built in a cavity of a tree. The usual clutch is 3–5 eggs. Incubation averages 15–16 days. The chicks are fed by both parents, with small insects for the first 8–10 days, then nectar, fruit and larger insects. They remain in the nest for 26–32 days. After the young birds fledge, both parents feed them for two more weeks, or until the female begins her next clutch.*



[*Notiomystis cincta*, Tiritiri Matangi Island Open Sanctuary, New Zealand. Photo: Tui de Roy/ Roving Tortoise Photos]

On Little Barrier, the ranges of pair-members overlap around nest-sites, but individuals appear to forage mainly in separate areas, although sometimes both foraged at rich sources of food. Females tended to remain close to the nest-sites. Earlier implications that this species is territorial throughout the year on Little Barrier Island appear not to be correct.

On Kapiti Island, small groups with overlapping home ranges occupied areas of stream catchment some 500 m wide and stretching along 3 km or so of stream. Home ranges were similar in the breeding and non-breeding seasons, but breeding individuals spent more time close to the nest-site. On Mokoia, individuals range all over the 135 ha of the island.

Relationship with Man

Stitchbirds were formerly hunted for food by Maori people, who caught them using snares, and up to 100 could be caught in a day at some times of the year. Maori also made ornamental cloaks of Stitchbird feathers, which they called *kahu-hihi*. It required an enormous number of feathers, and therefore of birds, to make one of these cloaks. Clearly, the Hihi, as the Maori call this species, was well known to the earliest human inhabitants of New Zealand.

Following the European settlement of New Zealand, the Stitchbird was one of many animal species that held a particular fascination for western scientists, to whom many of the endemic taxa were in extremely odd in one way or another. As a consequence, Stitchbirds were subjected to uncontrolled collecting by scientists and others, and this is believed to have led to a substantial drop in the numbers of this species (see Status and Conservation).

Status and Conservation

This remarkable species is one of New Zealand's rarest birds and is considered globally threatened. It is classified in the category of Vulnerable. From the mid-1880s until very recently, the Stitchbird has survived only as a remnant population on a single island that avoided the introduction of mammalian predators and did not suffer significant anthropogenic change to the vegetation. Such small offshore and outlying islands have been vital to the survival of many species of New Zealand fauna, especially birds.

Preceding the European settlement of New Zealand, in the early 1800s, the Stitchbird had survived the arrival of the Polynesians and the changes wrought on the New Zealand environment by their settlement. It was still a fairly common species on the North Island of New Zealand at the time of European settlement, and it remained so until the early 1870s, when it was found in the southern North Island and on Kapiti and Great and Little Barrier Islands. After this, however, the species underwent a rapid decline, and the last mainland record was in the Tararua Range, near the Wairarapa Valley, in February 1883. By 1885 the Stitchbird had been lost from the mainland and from Great Barrier and Kapiti Islands, surviving only on Little Barrier Island. The current population on Little Barrier Island, known also as Hauturu, is believed to be between 500 and 2000 individuals, the total having been revised downwards from earlier estimates of as many as 4000–5000 birds. Several hundred additional Stitchbirds are found in translocated populations.

There have been no verified records on the main island since 1883, despite later unconfirmed reports and rumours of individuals in the Ruahine Range and a report from Ngunguru, near Whangarei, in 1936. It was suggested that the latter, if accurate, may have involved a bird blown from Little Barrier Island.

The reasons for the extirpation of the mainland populations of the Stitchbird are not known with certainty, nor are the reasons for its fortuitous survival on Little Barrier Island. It is suspected, however, that the species' decline was caused mainly by a combination of destruction of habitat, the introduction and spread of mammalian predators, avian disease, and the excessive collecting of specimens for museums. No doubt these factors acted in concert.

Loss and modification of habitat are likely to have resulted in the isolation of populations, as Stitchbirds appear reluctant to cross open areas. Furthermore, they may have created shortages of both nesting cavities, with the loss of mature trees, and food, with the loss of the plant diversity needed to provide a sufficient year-round supply of nectar and fruit.

Throughout New Zealand, introduced mammalian predators have had a significant impact on birds, including the Stitchbird. The most destructive of these mammals appear to be feral cats (*Felis catus*), the three species of mustelid, particularly the stoat (*Mustela erminea*), and rats and mice, especially the black rat (*Rattus rattus*). The Stitchbird survived the pre-European introduction of the Pacific rat (*Rattus exulans*), known also as the kiore, which is predominantly vegetarian, and co-existed with this species on the mainland for some 1000 years, and has done so on Little Barrier Island until the present day. Stitchbirds managed to co-exist also with brown rats (*Rattus norvegicus*) on the mainland for many years following this species' introduction in New Zealand with some of the earliest European contacts. They also survive on Kapiti Island in the presence of both Pacific and brown rats. Although cats may have had a significant impact, these birds successfully co-existed with feral cats on the mainland for many years and on Little Barrier Island for more than 100 years up to 1980, when cats were eradicated.

The rapid decline of this species in the mid-1800s did, however, coincide with the introduction of black rats. As Stitchbirds roost and nest in tree-cavities, black rats readily prey on eggs, chicks and, possibly, incubating females during the breeding season and on roosting birds at any time. The mustelids were not introduced in New Zealand until after the extinction of the Stitchbird on the mainland, but they are considered a potentially significant predator and a major threat to the biosecurity of the islands on which Stitchbirds occur. They also represent a considerable obstacle to the successful reintroduction of Stitchbirds on the mainland.

Stitchbirds are affected also by avian diseases, and the species' rapid decline in the nineteenth century may have been a result, at least in part, of disease brought and transmitted with exotic birds that were introduced in New Zealand around the same time as black rats. A similar decline recorded in populations of the Tui and the New Zealand Bellbird, and a possible decline on Little Barrier Island in the absence of black rats, in the same period provide some evidence that disease may have contributed to the demise of the Stitchbird. Contemporary studies have found Stitchbirds to be particularly susceptible to at least two avian diseases, namely aspergillosis and coccidiosis. Aspergillosis from infection by the pathogenic fungus *Aspergillus fumigatus*, which is prevalent in highly modified habitats, was a significant limiting factor for the translocated population of Stitchbirds on Mokoia Island and may have a serious impact on other populations. This fungus is more prevalent on Mokoia than it is on Tiritiri Matangi Island, which in turn has a higher level than is found in the natural population on Little Barrier Island.

Together, black rats and disease were possibly the two main factors leading to the decline and extinction of Stitchbirds on the mainland and on Kapiti and Great Barrier Islands. A further factor is the collecting of specimens for scientific purposes. Although this is no longer a serious problem, this was not the case in earlier times. Following the European discovery and settlement of New Zealand, the Stitchbird was ruthlessly collected, a great many specimens being brought to Britain and elsewhere in Europe. Of the 181 specimens collected in the nineteenth century, the majority, up to 130, were taken by one Austrian collector, A. Reischek, and he undoubtedly killed more than those that have survived in collections. This scientific collecting was likely to have been a contributing factor in the decline of the species in the North Island. As early as 1892, Sir Walter Buller stated to the Auckland Institute, in relation to the Stitchbird: "An Auckland collector has recently been on a visit to the Little Barrier Island for the purpose of getting specimens of this rare bird, several of which were obtained. This is the last refuge of the species, and unless the strong hand of the Government is invoked for its protection, and that at once, the Stitchbird will soon be lost to us for ever. Let us hope that steps will be taken to save the colony from this reproach."

Conservation action for the Stitchbird has focused mainly on the translocation of individuals from Little Barrier Island to other predator-free islands, with the aim of reintroducing or establishing viable populations on these. Such translocations began in 1980. The success of these projects has varied, but, of those populations that persist, none is currently self-sustaining. Between 1980 and the present, Stitchbirds were introduced on five small islands, and in the middle of the first decade of the twenty-first century birds were reintroduced at two managed sites on the main North Island.

The first translocations were to Hen Island, a 500-ha island in the Hen and Chickens Group, with 30 individuals released in March 1980 and a further 16 in April 1981. Stitchbirds were also transferred to 195-ha Cuvier Island, where 29 were released in June 1982 and an additional 37 in April 1985. Neither of these introductions was successful, the last records being of one or two individuals on Hen Island in 1994 and a singleton on Cuvier Island in 1993.

In the same period, 30 Stitchbirds were released on Kapiti Island (1966 ha) in August 1983, 30 in August 1984, and twelve in August 1990. By August 1991, however, only four individuals could be found on Kapiti. Subsequently, 48 birds, 24 males and 24 females, were transferred from Little Barrier Island to Kapiti in August 1991, and a further 24 males and 23 females were released there in August 1992. Nevertheless, the population on Kapiti continued to decline without intervention, and supportive management of the population began in 2000. A further release was made in 2002, with the transfer of 14 of the surviving individuals from the translocated population on Mokoia Island. The Stitchbird population on Kapiti Island persists with ongoing management.

In September 1994, 40 individuals, comprising 20 of each sex, were translocated from Little Barrier Island to Mokoia Island (135 ha), in Lake Rotorua. This population survived, and was stable while under active management, but it declined when supportive management was stopped. Owing to a lack of breeding success, a shortage of resources for supplemental feeding and monitoring, and competing conservation priorities, the remaining 15 Stitchbirds on Mokoia were transferred in 2002, one going to Pukaha Mount Bruce and the rest, as mentioned in the preceding paragraph, to Kapiti Island.

The last of the island introductions has been on Tiritiri Matangi, a 220-ha island lying 4 km off the coast of the Whangaparaoa Peninsula, north of the town of Auckland. A total of 38 Stitchbirds, 20 males and 18 females, was transferred to this island in September 1995, with a further four males and nine females released there in 1996. This population has shown a constant increase with ongoing management, and it is suspected that the island may soon reach its carrying capacity for this species. The breeding population is small but expanding, rising from 14 breeding females in 1997–1998 to 42 in 2003–2004, and exists in some 30 ha of remnant and regenerating closed-canopy forest on the island.

Most recently, after more than 120 years of almost complete absence from the main North Island, Stitchbirds have been reintroduced at two carefully managed mainland sites, one at Karori Wildlife Sanctuary, in Wellington, and the other at Cascade Kauri Park, in the Waitakere Ranges, near Auckland. In February and May 2005, 60 Stitchbirds were transferred to Karori from Tiritiri Matangi Island. In early 2007, 59 individuals, mostly juveniles and again from Tiritira Matangi, were transferred to Cascade Kauri Park. By November 2007, the Stitchbirds at the latter site had bred, chicks had hatched, and at least some nests succeeded in producing fledglings. A further 60 Stitchbirds were transferred to Cascade Kauri Park in May 2008. The transfers to the mainland sites came about after intensive programmes to remove or control introduced browsing and predatory mammals, especially common brushtail possums, rats, stoats and feral cats. The removal of the possums has allowed much vegetation to recover.

Lastly, a small population, numbering some 5–12 individuals, is maintained at the Pukaha Mount Bruce National Wildlife Centre, in the southern North Island. Four transfers, totalling 16 wild Stitchbirds, have been made since 1990, one in each of 1995, 1999, 2001 and 2002. A captive-breeding programme is in place, enabling conservationists to conduct research on Stitchbirds, and to develop effective husbandry techniques for the species in order to deal with such problems as stress and disease in case of a catastrophic event affecting the population on Little Barrier Is-



Although common on New Zealand's North Island and offshore islands at the time of European settlement, by the mid-1880s ***Stitchbirds*** *survived only as a remnant population on Little Barrier Island. Habitat destruction, hunting by Maoris for food and ornament and by Europeans for museums, predation, and introduced avian diseases, probably all acted to extirpate the other populations. Translocations to predator-free islands began in 1980, but these populations rely on intensive management. Stitchbirds have also been reintroduced to two mainland sites. The natural population on Little Barrier is stable at up to 2000 birds. The Stitchbird is listed as Vulnerable. The current recovery plan aims to make five populations self-sustaining.*

[*Notiomystis cincta*, New Zealand. Photo: Robin Bush/ www.photolibrary.com]

land. In addition, it allows scientists to test methods that could assist with the establishment of new and self-sustaining populations in the wild, to produce birds for release into the wild and to improve the survival of released individuals, as well as to understand and manage relevant diseases. Pukaha Mount Bruce has produced 21 chicks for release on Kapiti Island since 2000, and it continues to breed Stitchbirds for future releases on Kapiti and elsewhere.

Current management for the Stitchbird, one of New Zealand's rarest birds, involves a recovery plan, the present one, for 2004–2009, succeeding an earlier plan (1995–2000). The main, long-term goal of the current plan is to increase the number of self-sustaining populations of Stitchbirds to five. The only self-sustaining population, however, is still that of Little Barrier Island, those on Kapiti and Tiritiri Matangi Islands and the two mainland North Island sites persisting only through active management.

The supportive management involved in the translocated populations on Tiritiri Matangi and Kapiti includes several strategies. One is the provision of nestboxes, which facilitates breeding in the absence of natural cavities, but also permits easy access for monitoring breeding and for manipulation of nests and breeding, such as the removing of infertile eggs to encourage re-laying. A second is the provision of artificial feeders in order to maintain an adequate supply of food, which assists with population-monitoring. In addition, all fledglings are individually ringed for the purposes of identification and determination of demographic parameters, and birds released as part of translocations are likewise ringed. Finally, there is intensive management of infestations of nest parasites, primarily mites (Acarina), and nestboxes are carefully cleaned after breeding attempts in order to inhibit the spread of disease within the population.

As an example, on Tiritiri Matangi Island, supplementary food is provided throughout the year in the form of *ad libitum* sugar solution (20% weight/volume) from up to nine feeding stations, which are used regularly by all adult Stitchbirds on the island. These feeding stations are needed because there can be a shortage of natural food; they were situated at the forest edges, and not within territories of individual birds. Further, as the main habitat on the island comprises young, regenerating forest, there are few natural cavities for nesting. Small groups of two or three nestboxes are placed in likely nesting areas, attached to tree trunks at a height of about 1·5 m.

Little Barrier Island, home of the last natural population of the Stitchbird, has for long been a reserve. It was formally protected in 1894, when it was purchased by the Government from its Maori owners and was designated a bird sanctuary. In 1977, the island was gazetted as a nature reserve. Little Barrier Island, however, lies in the outer Hauraki Gulf, which is subject to great human pressures through high and increasing levels of recreational and commercial use.

With the gradual maturation of the vegetation of the islands to which Stitchbirds have been translocated, it is possible that the populations will become self-sustaining. The mainland populations will, however, require continuing management of predators. Recent research on Tiritiri Matangi Island, where tourism is encouraged in part as a means of funding the ongoing species and habitat restoration programmes and public-awareness campaign, found that Stitchbirds did not avoid nesting near walking tracks and that there was no difference between the reproductive parameters of Stitchbirds nesting near paths and those nesting in areas with no public access. It appeared that, for all the monitored species on the island, any adverse effects of tourism are small and are outweighed by the benefits that tourism generates.

The New Zealand Department of Conservation, Massey University and the University of Auckland, and the Pukaha Mount Bruce National Wildlife Centre, as well as other bodies, are all involved in active research on Stitchbirds, research that has greatly increased our knowledge of the biology and ecology of this species over the last two decades. Further, there is a great deal of active and co-ordinated management of the remaining populations and programmes aimed at increasing the geographical spread of the species through translocations. Although the Stitchbird is seriously threatened, there has been significant action in New Zealand over many years to try to ensure the survival of this unique species, now recognized as the sole representative of its family (see Systematics).



PLATE 13

inches 2
cm 5

Genus *NOTIOMYSTIS* Richmond, 1908

Stitchbird

Notiomystis cincta

French: Hihi de Nouvelle-Zélande **German**: Hihi **Spanish**: Hihi
Other common names: Hihi, Ihi, Kotihe, Pogonornis

Taxonomy. *Meliphaga cincta* du Bus de Gisignies, 1839, North Island, New Zealand.
Traditionally placed in the honeyeater family (Meliphagidae), but recent DNA studies, combined with morphology, indicate that it belongs in a monophyletic family of its own. Falls within a clade that includes the New Zealand wattlebirds (Callaeidae); affinities of this clade uncertain, but it appears to be a basal assemblage that may include the berrypeckers and longbills (Melanocharitidae) and the cnemophiline satinbirds (currently Paradisaeidae). Proposed race *hautura* (described from Little Barrier I) said to differ from birds in rest of species' former range in shorter wing and yellower breast of male, but some overlap in characters apparent. Treated as monotypic.
Distribution. Little Barrier I (Hauturu), in outer Hauraki Gulf, off N North I (New Zealand). Reintroduced on Kapiti I, off SW coast of North I; and at two sites on main North I, at Karori Wildlife Sanctuary, near Wellington, and at Cascade Kauri Park, near Auckland. Also introduced to Tiritiri Matangi I, in Hauraki Gulf.



Descriptive notes. c.18 cm; male 29–42 g, female 26–35 g. Medium-sized passerine with moderately long, slender and slightly decurved bill; moderately long tail, often held cocked. Male has velvet-black hood with short, erectile white nape-tuft, hood bordered by golden-yellow shoulder patch (including marginal secondary coverts) that continues as band across lower breast, where broken in mid-line; black of hood grades to grey-black on mantle, back and scapulars, and to dark brownish-olive on rump and uppertail-coverts; upperwing black, prominent white patch at base of tertials and inner greater secondary coverts, narrow yellow fringes on outer greater coverts and thin yellow tips on median coverts, yellow edges of secondaries (forming wingpanel), and thin pale yellow distal edges of primaries (in flight, wing appears blackish with golden-yellow shoulder patch on inner leading edge and conspicuous white patch at base); uppertail blackish-brown, rectrices with yellowish edges; underbody below lower breast pale brownish-grey, diffusely streaked darker; underwing buff-white with broad dark grey trailing edge and tip, underside of tail dark brownish-grey; iris blackish-brown, narrow grey-black orbital ring; bill black; legs pinkish-brown to dark red-brown or grey-black, soles cream-coloured. Female is smaller than male, also duller and plainer (lacks golden shoulder patch and breastband), being brownish-olive above, with only tiny (rarely visible) white tuft on side of nape, upperwing pattern like that of male, including prominent white patch, but ground colour black-brown, and yellow areas duller, more olive-yellow; chin, throat and underparts off-white with brownish-grey wash and diffuse dark brownish-grey streaking. Juvenile is like female, but slightly browner above and uniformly dark grey-brown to brownish-buff below, pale patch on folded wing smaller and buff, pale fringes on secondary coverts dull yellow-brown, pale edges of remiges grey-brown, bill grey-black with dirty yellow or brownish-orange basal two-thirds of lower mandible, and gape swollen, yellow to orange-yellow; immature very similar to adult of corresponding sex, but retains juvenile remiges, primary coverts and alula; immature male sometimes distinguishable in close view by duller and browner greater primary coverts and alula with narrow yellowish edges (these wholly black in adult male), and in the hand retained juvenile plumage of immature female slightly duller and browner than adult female's. Voice. Range of mainly high-pitched vocalizations, some given throughout year, others only in breeding season. Male has seven identifiable vocalizations, female five (most female calls quiet, audible only within a few metres); at least eight further calls shared by sexes. Common call of both sexes is warning call, a "titch" note, given singly or (with increasing alarm) in accelerating series, when may merge into alarm call, which a series of high-pitched "yeng" notes. Contact call (both sexes), heard often and throughout year, a high-pitched and plaintive single or double "wee" or "tseet", usually answered by another. Other calls by both sexes include, among others, a soft warble, "Aggressive Chat", high-pitched parental call directed at fledglings, and squeaks. Male song a loud, melodious high-pitched whistle of 2–3 notes, e.g. "wee-ah-wee", "wee-ah", or "trr-ah-wee", mainly or most frequently during the breeding season. Other male vocalizations include "chi-ching", given only near nest; "Identification Chat", a series of squeaky and warbling sounds given at meeting with mate; two cooing calls; and metallic call during display-flight. Female vocalizations include several calls associated with copulation or when being chased by males attempting forced copulation; short, soft, high-pitched "sweet" as identification call from nesting cavity in reply to mate; and hisses in aggression.
Habitat. Dense native forests, with some movement between forest types to exploit seasonal flowering or fruiting. On Little Barrier I prefers mature, moist, hardwood forest, particularly mixed forests of tawa (*Beilschmiedia tawa*) and northern rata (*Metrosideros robusta*) in valleys, and tawa with towai (*Weinmannia silvicola*) on steep slopes at higher elevations; found less often in kauri–hard beech (*Agathis australis–Nothofagus truncata*) ridge forest, regenerating valley forests of kanuka (*Leptospermum ericoides*), wet ridge forest of tawa, towai, tawari (*Ixerba brexioides*) and miro (*Prumnopitys ferruginea*), or coastal pohutukawa (*Metrosideros excelsa*) forest; least common in *Leptospermum* forest on ridges, and in stunted summit forests. Extinct population on North I originally inhabited broadleaf evergreen forest; mature forest of Little Barrier I thought to be very like undisturbed habitat of mainland North I formerly used by this species. Requires mature forest for breeding. On Little Barrier I recorded at all altitudes from lowest valleys to high summits (highest point 722 m), but mainly in valleys and lower ridges to c. 300 m.
Food and Feeding. Diet nectar, fruit and small arthropods. Arthopods mainly insects, including beetles (Coleoptera), but also spiders (Araneae). Proportions of main items in diet vary seasonally, geographically (between natural population on Little Barrier I and various translocated populations) and, where data exist, among different studies within populations; variation probably due mainly to availability. Differences between islands probably relate to differences in floristic composition and in flowering and fruiting phenology of respective flora. Invertebrate and plant exudates such as lerp, manna and honeydew also consumed. Takes fruit and nectar from wide variety of plants. On Mokoia I, nectar usually taken from plant species contributing greatest proportion of nectar standing crop at the time, and tended to avoid flowers comparatively low in nectar; proportion of time spent in feeding on different species of fruit not related to available store of carbohydrates in fruit. Forages at all levels, including occasionally on ground, but mainly in trees and shrubs; in one study on Little Barrier I, foraged mostly in middle and lower levels of understorey, but also often in subcanopy and canopy. Most foraging carried out among fine twigs, leaves and terminal shoots of trees and small shrubs; sometimes in canopy of trees, especially among flowering and fruiting mistletoes (Loranthaceae). Agile and acrobatic when foraging, often hanging upside-down to reach flowers and fruit. Nectar taken by probing flowers; invertebrates and plant and insect exudates obtained mainly by gleaning from foliage or branches, also by probing beneath bark, and sallies into air to catch flying insects. Usually in pairs or, particularly outside breeding season, in small groups of up to ten individuals. Sometimes associates with meliphagids, i.e. Tui (*Prosthemadera novaeseelandiae*) and New Zealand Bellbird (*Anthornis melanura*), and often part of mixed-species feeding flocks. Will travel several kilometres daily between preferred feeding sites, and known to visit artificial feeders up to 1·5 km apart during same day.
Breeding. Recorded Sept/Oct–Feb/Mar, but not synchronous within populations; first eggs usually mid-Oct but annual variation (e.g. on Kapiti I first clutches laid 16th Nov–9th Dec in one year, 5th–19th Dec in next); up to two or, occasionally, four breeding attempts in a season. Nest almost invariably built by female alone, a platform of sticks and rootlets supporting a cup made from fern rhizomes, cup bound together with spider web, lined with fern scales and feathers, almost always

placed in hollow or other cavity in trunk or branch of mature living tree, sometimes in dead tree or cavity in other site, and on islands where translocated artificial nestboxes used; on Little Barrier I nests c. 1–18·5 m (mean for nine nests 6·25 m) above ground. Clutch 3–5 eggs, sometimes 2, exceptionally 6, second clutch in season usually one egg fewer than first clutch; eggs laid at one-day intervals, in morning, laying 1 hour later each morning; incubation by female only, beginning with completion of clutch, period 13–19 days (mean 15·75 days); chicks brooded by female, male sometimes assisting, fed by both sexes, female doing considerably more of provisioning than male, both adults remove faecal sacs (but nest quickly becomes fouled), nestling period 26–32 days; young fed by parents for up to 2 weeks after fledging, contribution of each adult and rate at which young fed (and for how long) dependent on whether female making another breeding attempt. Juveniles join crèches c. 1 week after fledging.

Movements. Sedentary. Individuals move widely within home ranges, up to several kilometres daily, to exploit seasonally available nectar or fruit.

Status and Conservation. VULNERABLE. Restricted-range species: present in North Island of New Zealand EBA. Rare. Natural population confined to Little Barrier I, where current estimated population 500–2000 individuals; formerly estimated as high as 4000–5000 birds. Translocated populations on Kapiti I (c. 100 birds) and on Tiritiri Matangi I (c. 150 birds); reintroduced populations established on main North I at Karori Wildlife Sanctuary (translocation of 60 individuals in 2005, population estimated at 37 birds in Oct 2006) and at Cascade Kauri Park, in Waitakere Ranges, near Auckland (59 birds translocated in 2007 and a further 60 in May 2008). Unsuccessfully translocated to Hen I (in Hen and Chickens Group) and Cuvier I (Repanga I); also to Mokoia I (in L Rotorua), and that population later transferred to Kapiti I. Formerly widespread on North I and several adjacent offshore islands, but by mid-1880s natural population confined to a single island, Little Barrier I, in outer Hauraki Gulf. Causes of rapid decline and extinction on mainland and on Kapiti I and Great Barrier I not certainly known; suspected that main reason was a combination of loss of habitat, introduction and spread of mammalian predators, especially black rats (*Rattus rattus*), avian disease, and excessive collecting of specimens for museums, these factors having no doubt acted in concert. No translocated populations self-sustaining, but those on Kapiti I and Tiritiri Matangi I increasing through intensive and ongoing management. Translocated populations reliant on supplementary feeding, provision of nestboxes and, in the case of mainland population, intensive predator control. A small captive population is held at Pukaha Mount Bruce National Wildlife Sanctuary.

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Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family GRALLINIDAE (MUDLARKS)



- Medium-sized passerines with small head, longish slender bill, long legs and fairly long tail; plumage distinctively black and white.
- 20–30 cm.



- Australia, New Guinea and Timor.
- One species near upland streams, the other in open habitats with water source.
- 1 genus, 2 species, 3 taxa.
- No species threatened; none extinct since 1600.

Systematics

The family Grallinidae comprises only two species, the Torrent-lark (*Grallina bruijni*) of New Guinea and the Magpie-lark (*Grallina cyanoleuca*) of Australia. Not long after it was first described, in its present genus, the Torrent-lark was placed in a different genus, *Pomareopsis*. The separation of the two species at the generic level, however, was not supported in an early list of bird species published by the British Museum, nor in later publications, although it persisted into the 1960s.

The relationship of the two species to other avian taxa has been the subject of considerable speculation. The Magpie-lark was originally named, in 1801, *Corvus cyanoleucus*, suggesting a perceived affinity with the crow family (Corvidae). In the 1870s, however, the British Museum placed both the Torrent-lark and the Magpie-lark in the Prionopidae, a family that now comprises the helmet-shrikes. This classification was still accepted by some authors until the middle of the twentieth century, but it, as well as an affinity with the crow family, was questioned or ignored by some researchers.

In the same period, the Magpie-lark was placed in its own family, Grallinidae, in some publications and, in a list of Australian birds published in 1946, this was positioned next to the monarch-flycatchers (Monarchidae), which were then treated as a subfamily of the Old World flycatcher family Muscicapidae. Furthermore, the Magpie-lark was referred to as being "merely a ground-living flycatcher" and, together with the Torrent-lark, was considered closely related to the monarch-flycatchers in a major publication on the birds of New Guinea, contributed by T. Iredale, in 1956.

At about the same time, it was suggested, on the basis of perceived similarities in their skeletons and their nests, that the two species were in fact closely related to the White-winged Chough (*Corcorax melanoramphos*) and the Apostlebird (*Struthidea cinerea*) of Australia. Subsequently, most authors included all four species in the Grallinidae, although the extent of the differences among the species were sometimes noted and two subfamilies were generally recognized. These were the Grallininae, for the Magpie-lark and Torrent-lark, and the Corcoracinae or Struthideinae, for the other two. Some taxonomists preferred to treat these as two full families, Grallinidae and Corcoracidae/Struthideidae. It was also suggested, on the basis of an examination of skulls, that the family Grallinidae was related to the butcherbirds and currawongs (Cracticidae) and the woodswallows (Artamidae) and, from a comparison of egg-white protein, to the crows in the family Corvidae.

With the advent of comparative studies of DNA in the 1980s, an affiliation with the crows was emphasized. The principal researchers using these relatively modern genetic techniques placed many Australasian species, including the Torrent-lark and the Magpie-lark, in a greatly expanded family Corvidae. They aligned both of these species with the monarch-flycatchers and, more distantly, with the fantails (*Rhipidura*) and drongos (*Dicrurus*), all of which they placed in a subfamily Dicrurinae. Further, the results of their analyses strongly indicated that the two *Grallina* species were not closely related to the White-winged Chough or the Apostlebird. Other researchers have preferred to accord this assemblage the status of a full family, rather than maintaining it as a subfamily of the Corvidae, and have thereby included *Grallina* within the family Dicruridae. The close relationship of *Grallina* to the monarch-flycatchers has been supported by a study of skull morphology, and some recent taxonomists have united them in the family Monarchidae.

Despite the results of DNA studies, and notwithstanding similarities in some features of external morphology, there are marked differences in behaviour and nest structure between *Grallina* and the monarch-flycatchers. Moreover, it is true to say that the allocation of genera and species to families still involves an element of subjective judgement. These factors suggest that, for the time being, the family Grallinidae perhaps should be maintained, although the close relationship to the monarch-flycatchers appears to be extremely probable.

Although it is widely distributed in mainland New Guinea, the Torrent-lark is a monotypic species, presenting no obvious differences among the various populations. The Magpie-lark, too, has often been treated as monotypic, but those individuals in north Australia are distinctly smaller than those in the south. These smaller birds, which have a proportionately shorter tail and longer bill, were described in 1912 as a subspecies, *neglecta*. Most subsequent authors considered the differences in size between the two to be clinal in nature, but other, more recent authors maintain that they are sufficient to warrant the recognition of this race. Indeed, the wing and tail lengths of male *neglecta* are significantly shorter than those of the southern populations of the species, and the former weigh less than the latter. It is worth noting, however, that the two subspecies intergrade in the region from central Northern Territory eastwards to west and north-central Queensland.



*The two members of Grallinidae, the **Magpie-lark** of Australia and the Torrent-lark* (Grallina bruijni) *of New Guinea, are similar in appearance, with distinctive black and white plumage. Both species show sexual dimorphism. The male (left-hand bird here) has white lines above the eye, and large white patches from the ear-coverts down to the side of the neck. The female Magpie-lark's forehead and throat are white, with a broad black band extending from the crown down the side of the face to the chest, and a broad white area extending from below the rear crown to meet the white of the underparts.*

[*Grallina cyanoleuca cyanoleuca*, Grey Range, Queensland, Australia. Photo: Graeme Chapman]

Too little is known about the Magpie-larks occurring on Timor and in south New Guinea for their subspecific identity to be determined. They may represent one or more further subspecies, but for the time being their taxonomic position remains a matter for speculation.

Morphological Aspects

Both the Torrent-lark and the Magpie-lark are medium-sized passerines, but they are large in comparison with the monarch-flycatchers, their closest relatives (see Systematics). The Torrent-lark is about 20 cm in length, while the Magpie-lark is bigger, with an average measurement of approximately 26 cm.

Adult male Magpie-larks are heavier than the females. In one sample, males of the nominate race had an average weight of 91·6 g, whereas the average for the females was 81·3 g. The corresponding figures for the smaller subspecies *neglecta* were 82·8 g and 75·4 g. Very few data are available for the Torrent-lark, but these indicate that males weigh around 40–41 g and females 38–40 g.

*Both grallinids have a small head and a long tail. The wings are long, broad and rounded. **Magpie-larks** are relatively slow fliers, and spend much of their time walking on the ground in open feeding areas. In connection with this, their legs are long and sturdy. This species is sedentary, with a longest recorded movement of just 15 km. However, it apparently arrived only recently in East Timor, suggesting it is capable of long-distance flight.*

[*Grallina cyanoleuca cyanoleuca*, Waikerie, South Australia, Australia. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]

The two grallinids have a smallish head, with a fairly long and slender bill. The wings are long and rounded and the tail is quite long. The legs are long and sturdy, as would be expected for birds which are largely terrestrial (see General Habits, and Food and Feeding).

The Torrent-lark and the Magpie-lark are similar in appearance, both having distinctively black-and-white plumage. The adults' bare parts, too, are of contrasting colours, the bill and iris being whitish and the legs black. Adult males and adult females can be distinguished in the field by differences in the pattern of the head, throat and breast. Juveniles have the bill and eyes dark, in addition to which the black parts of the plumage are tinged brown. Aggression occurs mainly between members of the same sex, at least in the case of Magpie-larks, and the sex-related plumage patterns enable rapid identification of rivals. The plumage of juveniles, which features a combination of adult male and adult female markings, may also may serve to inhibit aggression from adults.

Adult Magpie-larks have a complete post-breeding moult, in which the shedding of the primaries begins in November or December and continues until the last primary is replaced, in April or May. The tail feathers are replaced during approximately the same period and over a slightly longer time scale, sometimes starting in September and terminating in May. The body feathers are replaced over a protracted period, which apparently commences before the first of the primaries are shed and does not end until after all of the flight-feathers have been renewed. The post-juvenile moult is evidently partial, including all of the body feathers but only some of the wing-coverts and few or no remiges. For some juvenile Magpie-larks, moult into adult plumage begins six to seven weeks after leaving the nest, and while they are resident within their parents' territory. Most juveniles, however, start to moult about ten or eleven weeks after fledging and shortly after leaving their parents' territory. The complete moult takes three to four months. No comparable data are available for the Torrent-lark.

Habitat

Torrent-larks live close to small, fast-flowing streams bounded either by forest or by grassland in hills and mountains throughout mainland New Guinea. They have been observed at altitudes





Shy, possibly scarce, and certainly little-studied, the ***Torrent-lark*** *lives in hills and mountains throughout mainland New Guinea, close to small, fast-flowing streams, bounded either by forest or by grassland. It is usually seen singly, in pairs, or in groups of up to four birds, which may be family parties. Mainly found between 400 m and 2300 m, it has been recorded up to 2800 m in the Snow Mountains. Although it is widely distributed, the Torrent-lark is considered monotypic, with no obvious differences among the various populations. It is smaller than the Magpie-lark* (Grallina cyanoleuca) *and apparently weighs about half as much. Both grallinids are, however, large in comparison with the monarch-flycatchers (Monarchidae), which DNA indicates are their closest relatives. Despite some external similarities, the grallinids differ markedly from the monarch-flycatchers in behaviour and nest structure.*

[*Grallina bruijni*, Crater Mountain, EC New Guinea. Photo: William S. Peckover]

ranging from about 400 m to 2300 m, and sometimes higher, reaching 2800 m in the Snow Mountains. The species is occasionally sighted in forest distant from water, but it is assumed that such observations relate to individuals or groups travelling between streams.

Water also is a key component of the habitat of the Magpie-lark. Early records suggest that, at the time of European colonization in Australia, Magpie-larks occurred only close to rivers, lakes and other wetlands. They appear to have spread with the colonists as the latter cleared land for agriculture and created artificial watering sites to supply sheep and cattle. Magpie-larks are now found over much of mainland Australia, occurring in a variety of open or lightly wooded habitats, including grassland, farmland and even built-up areas, from sea-level to about 1000 m, occasionally to 1200 m. The species' main requirements are the availability of water, the presence of trees for roosting and for providing nest-sites, and a clayey soil suitable for building the nest (see Breeding). Relatively open vegetation is another key feature of suitable habitat, as Magpie-larks catch most of their food on the ground (see Food and Feeding). They do not occur in rainforest, wet eucalypt (*Eucalyptus*) forest, scrub and other dense vegetation, although they do exploit the edges of such habitats where there is more open vegetation, and they will visit these places after a fire, again when the habitat is open. They are common in farmland, inland pastoral areas, cities and towns.

The introduced population of Magpie-larks on Lord Howe Island, to the east of Australia, occurs primarily in open grassy paddocks and in open forest. It is absent from areas of denser forest, but can be found in the ecotone between lowland forest and paddocks.

Over much of their present range adults appear to be resident wherever there is permanent water. They are absent only in arid desert areas of western central Australia and the Nullarbor Plain, where there is no surface water for considerable periods of time. Elsewhere, they become relatively scarce around Darwin, in far northern Australia, during the tropical wet season and, in eastern Australia, they move away from high altitudes on the Great Dividing Range when snowfields are present in winter. These movements may be in response to extreme conditions. Flocks, which consist predominantly, if not entirely, of young birds, are more mobile, but they may still require water as part of their habitat.

General Habits

Almost nothing is known about the habits of the Torrent-lark. This species is considered to be scarce and relatively shy, but conspicuous because of its plumage and vocalizations. It is usually seen singly, in pairs, or in small groups of up to four individuals, which may be family parties. Torrent-larks spend much of the day in searching for food on rocks and gravel and in very shallow water associated with streams. They walk about actively on the ground, constantly moving the tail from side to side. It is presumed that they roost in trees. Male Torrent-larks perform a display in which the head is raised, with the bill pointing upwards, and the wings are opened and held vertically, showing the black undersurfaces when viewed from the front; this is accompanied by a nasal buzzy call. The wings also may be spread on landing.

In contrast, Magpie-larks are very common on the Australian mainland and have been studied in detail. Their general habits appear to be strongly influenced by the availability of important ecological resources. In agricultural areas of the south-west of Western Australia, adult Magpie-larks have lifelong pair-bonds and pairs maintain permanent territories. The territory may be abandoned if one partner dies or, among newly established younger pairs, following breeding failure. Adults may live for more than ten years, although there appears to be relatively high mortality among adults and a subsequent acceptance of new partners. The territories at three locations ranged in size from 5 ha to 25 ha, and the average size varied from about 13 ha to 19 ha. Most of the territories contained a permanent source of water,





*Most **Magpie-lark** territories contain permanent surface water, and the birds appear to bathe regularly. Birds have been watched bathing belly-deep in the water of a creek, either walking in from the bank, or jumping from a low rock. The birds plunged their heads beneath the surface, and rapidly beat their wings for less than one second. After this, they walked to shallower water or onto the bank, or jumped back onto the rock, where they proceeded to fluff up the plumage and preen. This procedure was repeated four times in a minute. In agricultural areas of Western Australia, adult Magpie-larks have lifelong pair-bonds, and maintain permanent territories of up to 25 ha. A pair will roost at night in a particular tree within the territory. The birds call from the tree before sunrise, before moving to another tree, where they preen and continue to call. They then fly down to the ground, and spend most of the day walking about, foraging. They may also patrol the boundaries of their territory during the first two hours of the day, when aggression is most likely to take place. Intruders, or pairs holding adjacent territories, are chased or dived at. There is a peak in aggression between neighbours early in the winter nesting season. Non-breeding Magpie-larks gather at roosts that may contain hundreds of birds. At daybreak the flocks break up into pairs, or small parties that may be families. Juveniles within these flocks feed and associate with individuals of the opposite sex, while being aggressive towards their own sex. This can lead to pair formation, when the birds either leave the flock to establish a territory, or take up a territory within the area occupied by the flock.*

[*Grallina cyanoleuca cyanoleuca.*
[Above: near Brisbane, Queensland, Australia
Photo: Brian J. Coates.

Below: Melbourne, Australia.
Photo: Rohan Clarke]



Aggressive towards their own species, ***Magpie-larks*** *will also tackle predators like this Little Eagle* (Hieraaetus morphnoides). *Magpie-larks perform at least 13 displays. In one of the commonest, the "Sculling" display, which is given in flight, the bird beats its wings several times and then glides, often calling simultaneously. This display is believed to be primarily for maintenance of the pair-bond, but perhaps has the secondary function of advertising and defending the territory.*

[*Grallina cyanoleuca cyanoleuca*, Innamincka, South Australia, Australia. Photo: David Stowe]

such as a farm dam, and all contained water in the nesting season. These sources also provided the mud that is needed for nest-building. It is thought that the maintenance of permanent partners and territories provides an evolutionary advantage by enabling Magpie-larks to start nesting as soon as rainfall creates appropriate conditions.

In the grounds of the Australian National University, in Canberra, which feature parklands with cultivated trees and lawns, the territory sizes are much smaller, covering only 1–2 ha in area. Further, pair-bonds appear to be weaker in this "urban" context, and more than 30% of observed pair-members separated after fewer than four months together. In some areas where climatic factors are extreme, such as Darwin, in Northern Territory, in the summer wet season, adults may abandon their territories and flocks will move away from the region.

At night, Magpie-larks roost in trees with reasonably dense foliage, including eucalypts, figs (*Ficus*) and mangroves, and exotic willows (*Salix*) and pines (*Pinus*). They will also use the introduced jacaranda tree (*Jacaranda mimosifolia*), which is considered an invasive species in several parts of Australia. The members of a pair will roost in one of several specific trees within their territory, and the partners typically call from that tree before sunrise. They then fly to another tree nearby, where they will preen and continue to call for a period of time, before flying down to the ground and starting to forage; they also "patrol" the boundaries of their territory during the first hour or two of the day. They spend most of the rest of the day in walking about on the ground, actively searching for food. At sunset, the birds fly back to the roost tree and give a few calls, before settling down for the night.



Each pair of ***Magpie-larks*** *has a signature call. One bird begins to give loud metallic notes at intervals of about one second, and its partner joins in during the intervals, creating a highly synchronized sequence of alternating calls, known as "antiphonal calls". Each pair has a repertoire of calls distinct in tone and components from other pairs, even within the same region, though differences are most pronounced between birds from different regions. Antiphonal calls are usually given when the pair members are together, but during the nesting season, they may call while one bird is brooding and the other foraging.*

[*Grallina cyanoleuca cyanoleuca*, Geelong area, Victoria, Australia. Photo: Peter Fuller]

Many observations of communal roosting have been recorded. Indeed, mobile flocks of non-breeding Magpie-larks regularly roost together in trees, particularly during the non-breeding season. Such roosts often contain hundreds of individuals, and one roosting flock in fig trees was estimated to number something in the region of 3000 individuals. Although the birds leave the roost at daybreak in pairs or in small parties, the latter thought to be families, there are also some reports of huge flocks leaving en masse.

Territories are defended by means of aggression and vocal behaviour. Most aggression occurs in the first two hours after sunrise, and is directed both at intruders and at pairs holding adjacent territories. It typically occurs along the common boundary of their territories and varies seasonally, with a peak in frequency and duration early in the winter nesting season. Aggressive behaviour comprises mostly chasing, diving at or flying rapidly towards opponents. Males are involved in more aggressive interactions than females, and individuals tend predominantly to attack members of the same sex. The main function of this intraspecific aggression appears, therefore, to be that of mate protection in the context of territory maintenance.

The Magpie-lark is known to use at least 13 different displays. Two of these are performed when the bird is in flight, and the remainder while it is perched. Six of the perched displays involve wing movements, and five involve a change in body posture with no wing movements. By far the most common displays are the "Sculling" display, the "Wing-flash" and the "Bow-flick". In the first of these, given in flight, the bird beats its wings several times and then glides, often calling simultaneously; this display is believed to be primarily for the maintenance of the pair-bond, but perhaps with a secondary function of advertising and defending the territory. The other two are performed on a perch. In the wing-flash, the individual repeatedly opens and raises one wing or both wings upwards and outwards, away from the body, while repeatedly calling; this display is strongly associated with antiphonal calls (see Voice), and the partner usually gives the same display. In the bow-flick display, performed throughout the year, the Magpie-lark bows forwards with its tail lowered and fanned, and then quickly tilts upright while flicking the tail upwards, usually uttering song while in the upright posture; this display, as with the previous one, is strongly associated with antiphonal calls, and is normally given by both partners. It is believed to have the same functions as the aerial sculling display.

Ten of the displays of the Magpie-lark are usually given in the presence of a partner, but three, termed the "Wing-waving", "Dropped-wings" and "Flat-wings" displays, are performed in other social contexts. Most of the displays are accompanied by calls. The dropped-wings and flat-wings displays occur mostly during aggression between individuals of the same sex, and may be appeasement displays.

Immature Magpie-larks, after having left their parents' territories, join together in flocks, which range in size from small numbers to thousands of individuals. These include birds in juvenile plumage, young birds that are moulting or have recently acquired adult plumage, recently paired young adults, second-year pairs, and one or more older pairs from territories that overlap with the area being used by the flock. The number of individuals within a flock increases markedly in the period immediately following the nesting season, and declines as the subsequent nesting season approaches.

The flocks tend to remain in a limited geographical region and to occupy areas that are mostly outside, but overlap parts of, the territories of adults. Within the flock, the juveniles roost together but tend during the day to feed close to individuals of the opposite sex and to call and associate with them, while exhibiting aggressive behaviour towards individuals of the same sex. The associations eventually lead to the formation of pairs within the flock. Such pairs leave the flock in order to establish a territory, or they become increasingly aggressive towards other Magpie-larks and establish a territory within the area occupied by the flock.

Pairs acquire territories by occupying and defending areas that are on the edges of existing territories, rather than by exhibiting persistent aggression against the original owners. They may also occupy areas in which one of the former resident pair of Magpie-larks has died. Some young paired birds in their first year will not be successful in establishing a territory and in breeding, and these may rejoin a flock in their second year.

Magpie-larks are conspicuous birds, they are relatively slow fliers, and they spend much of their time in feeding in open areas on the ground, often in the proximity of families of Australian Magpies (*Cracticus tibicen*). The latter usually detect and attack predators, and this may benefit the Magpie-larks, which also are aggressive but are less bold. There are records of predation on Magpie-larks by the Black-breasted Buzzard (*Hamirostra melanosternon*), the Whistling Kite (*Haliastur sphenurus*), the



Both members of Grallinidae feed mainly on invertebrates, though they occasionally take small vertebrates like frogs and lizards. ***Magpie-larks*** *forage mainly on open ground, including the edges of wetlands, exposed tidal flats, and even lawns in urban areas. They often scratch at the ground, then move backwards to snap up prey thus uncovered. They will also flush and pursue prey in grass, and sally into the air from the ground or a perch to catch flying insects. The foraging techniques of Torrent-lark* (Grallina bruijni) *are very similar. While foraging, it persistently wags its tail from side to side, and fans its wings.*

[*Grallina cyanoleuca cyanoleuca*, Brisbane, Queensland, Australia. Photo: Ian Fisher]



*During the hot hours of the day, **Magpie-larks** need to drink; they may also drink in the early and late hours. They have been seen drinking from garden ponds, and also from taps. They tend to be resident wherever there is permanent water, and are absent only from Australia's arid deserts, though in northern Australia they may become scarce during the tropical wet season. Magpie-larks will wade in the muddy margins of pools and streams while foraging, and both species of grallinid will snatch prey items from the surface of the water. On very wet mud, Magpie-larks employ the technique of "foot-trembling" to bring items to surface.*

[*Grallina cyanoleuca cyanoleuca*, Geelong area, Victoria, Australia. Photo: Peter Fuller]

Collared Sparrowhawk (*Accipiter cirrocephalus*), the Grey Falcon (*Falco hypoleucos*) and the Barking Owl (*Ninox connivens*).

As already mentioned, Magpie-larks often preen very soon after leaving the roost in the morning. One female was seen to preen for up to 20 minutes in the early morning. In addition, pairs often rest and preen in the early part of the afternoon.

Magpie-larks appear to bathe fairly regularly. On two occasions they were watched while bathing in the shallow, belly-deep water of a creek, into which they either walked from the nearby mudbank or jumped from a low rock. The birds plunged the head beneath the surface and rapidly beat the wings for less than one second, after which they walked to shallower water or on to the bank, or, alternatively, jumped back on to the rock, and proceeded to fluff up the plumage and preen. This procedure was repeated four times within the space of a minute. A single individual, standing 1 m from the bank, was observed to dash into the water and then immediately dash out of it, return to its original standing position, and begin to preen; it repeated this behaviour on three or four occasions while the observer watched. On one occasion, a Magpie-lark landed briefly on the surface of the water in a tank and fluttered its wings, splashing water over its plumage.

This species has been observed also to indulge in sun-bathing. One individual was watched as it sat on the ground in the full sunlight, with its back facing the sun and its wings held slightly out from the body, allowing the sun's warm rays to penetrate its plumage. Anting, too, has been recorded. A Magpie-lark picked up in its bill, three times, an ant of the species *Froggattella kirbyi*, which it rubbed beneath its right shoulder; it repeated this action on the left wing, before apparently eating the ant.

Voice

Only a few calls made by Torrent-larks have been described. One call, given in flight, has been described as a harsh, rasping, buzzy note that is easily heard above the sound of water. In addition, a male Torrent-lark was recorded as giving a nasal, buzzy "k-zaaat" call during a raised-wing display.

Far better known are the vocalizations of Magpie-larks. This species has fascinating vocal behaviour that is often associated with visual displays. Its vocalizations are of three main types. The first of these is termed solo calls, as when one individual utters a call and usually repeats it, at regular intervals of about one second, a variable number of times. The second type is antiphonal calls, when one member of an adult pair begins to call as with the solo call but its partner calls during the intervals in the series, the result being a highly synchronized sequence of alternating calls. The third main type of vocalization is termed rapid calls, whereby one individual repeats a high-pitched "pee" at a rate of about four per second in a relatively long sequence.

A large number of solo and antiphonal calls have been identified, but these are variants of a smaller series of basic call types. The calls are delivered most often in association with displays, particularly antiphonal calls with the wing-flash and bow-flick displays and solo calls with sculling displays (see General Habits).

The antiphonal calls of paired Magpie-larks are possibly the most pronounced and complex calls of this type of any species of bird. They are most often described as a sequence of repeated "ptowit, deedee", or a variant of this. Each adult pair, however, has a repertoire of antiphonal calls that differ noticeably in tone and/or components from equivalent calls given by other pairs. These differences, although most pronounced among birds from different geographical locations, are also evident among individuals living in one and the same area. This fact has enabled researchers to identify pairs by their calls alone. Each adult pair of Magpie-larks delivers a particular antiphonal call at dawn from its roost tree. This call is given only in this context and, because it differs from one pair to another, it is known as the pair's signature call. Most antiphonal calls are given in the first two or so hours from dawn, and most often when the pair-members are together in a tree or other elevated position with no other Magpie-larks nearby. During the nesting period, however, antiphonal calls are often emitted when the partners are separated, as one may be sitting on the nest while the other is in the process of foraging some distance away.

The contexts in which Magpie-larks employ antiphonal calls strongly suggest that the primary function of those calls is that of maintaining the bond between partners. These calls also "advertise" to other Magpie-larks that a territorial area is occupied by a pair of this species.



*Ten of the displays of the **Magpie-lark** are usually given in the presence of a partner. In the "Wing-flash" display, a bird repeatedly opens and raises one or sometimes both wings, while repeatedly calling. This display is strongly associated with antiphonal calling, and the partner usually gives the same display. Like the aerial "Sculling" display, wing-flashing is believed to help maintain the pair-bond. Magpie-lark breeding appears to be influenced by rainfall and daylength. Most egg-laying occurs in the austral spring and summer, but there are records for all months. In southern parts of Australia, breeding normally commences following the onset of winter rain in June, when a lasting source of mud for nest-building is available.*

[*Grallina cyanoleuca cyanoleuca*, Grey Range, Queensland, Australia. Photo: Graeme Chapman]

Interestingly, solo calls seldom elicit responses from birds other than the partner of the caller. The primary function of these calls appears to be that of maintenance of contact between pair-members when they are apart within their territory and, especially, when they are separated visually. As a result, the number of solo calls increases during the nesting season, when the partners are often apart.

Rapid calls are usually emitted during aggressive interactions between adjacent territorial pairs, between a pair and intruders into its territory, and between a pair and potential predators. These vocalizations are an important component of the aggressive behaviour of the Magpie-lark, and there is less noticeable variation among individuals and less geographical variation in this type of call. As aggressive interactions can occur at any time, the frequency of rapid calls, unlike that of solo and antiphonal calls, is not related to the time of day. The number of rapid calls given by a pair, however, increases during the nesting season.

The ability of Magpie-larks to identify the antiphonal, solo and rapid calls of their partners, and to distinguish them from those of their neighbours, has been demonstrated in field experiments, using playback of recorded calls.

Food and Feeding

Both members of this family feed predominantly on invertebrates that they catch on the ground. Both have been recorded catching and eating small vertebrates, the Torrent-lark occasionally consuming lizards and Magpie-larks sometimes eating frogs. In addition, Magpie-larks occasionally eat small seeds and grain. Both species appear to feed opportunistically, as a considerable variety of food items has been recorded in their diets. Among others, these include insects, molluscs, millipedes (Diplopoda), spiders (Araneae), worms (Oligochaeta) and crustaceans.

Grallinids are terrestrial in their foraging habits. Torrent-larks forage on exposed rocks and gravels of streams and roads, and they also take food items from the surface of water. Magpie-larks forage on open ground in natural areas, including on the edges of wetlands, on exposed tidal flats and on lawns in urban areas. The preference for feeding on the ground is probably the reason why Torrent-larks are restricted in their distribution to the vicinity of streams in dense forests, and why Magpie-larks occur mainly in farmland and relatively open vegetation.

The foraging techniques of the mudlarks are relatively simple. For example, the Magpie-lark walks along on the ground or wades in muddy waterside margins and gleans any suitable items which it finds. It will often stop and scratch a few times at the ground, and then move backwards a few centimetres in order to snap up a prey item thus uncovered. It has also been seen to flush and pursue prey in grass, and to employ the technique of "foot-trembling" on very wet mud in order to bring worms and other items to the surface. Both of the mudlarks will seize aerial prey by sallying briefly into the air, usually from the ground but sometimes from a low perch.

Magpie-larks drink water during the hot hours, and sometimes also do so in the early and late hours of the day. They have been observed drinking from garden pools and ponds, and from taps.

Breeding

Information on the breeding of the Torrent-lark is limited. Nests have been recorded from July to early January, which would indicate that breeding takes place at least from the middle of the dry season until the early wet season. Torrent-larks construct a cup-shaped nest from mud and rootlets, which they site on the branch of a tree or bush near a stream. There appear to be no published descriptions of the dimensions of the nest, nor any details of this species' nesting behaviour. The clutch is stated in some publications to consist of only one egg, but groups of up to four individuals have been sighted and it is thought that they may represent family parties. The eggs are described as being identical in colour and markings to those of Magpie-larks.

Far more information is available about the breeding habits and biology of the Magpie-lark, which is comparatively well known. The following details refer to that species.

For Magpie-larks, the onset of breeding appears to be influenced by rainfall and by daylength, or the total number of hours of daylight. This species begins to build its nest when sufficient



When sufficient rain has fallen to create long-standing pools, ***Magpie-larks*** *take mud from the margins, and combine it with strands of vegetation to build their nests. The nest is cup-shaped and relatively large, about 15 cm in diameter, and 8 cm deep. It is placed 5–20 m above ground, occasionally higher, usually on the outer part of a tree branch, though sometimes on a man-made structure such as a telegraph pole or fence post. Both partners work on the nest, but the male devotes more time to it. Each bird carries the nesting material in its beak, and places it in position by rapidly vibrating the head from side to side. It will also press its breast against the soft mud walls to shape the inside of the bowl. The finished nest is lined with fine stands of vegetation and small feathers. Nest construction may take anything from a few days to three weeks, and the nest may be used for second and subsequent broods, or alternatively a new one may be built. Mating takes place near the nest, during or shortly after the time in which the nest is lined, and the first egg is laid five to six days after the nest is completed. Clutches are of one to six eggs, which are pearly white marked with reddish and grey spots. Both sexes incubate the eggs during the day, for about 25 minutes at a time, but only the female sits on the nest at night. Incubation takes 17–19 days. Torrent-larks* (Grallina bruijni) *also construct a cup-shaped nest from mud and rootlets, siting it on the branch of a tree or bush near a stream. There appear to be no published descriptions of the dimensions of the nest, or indeed any details of the Torrent-lark's nesting behaviour. Nests have been recorded from July to early January, from the middle of the dry season to the early wet season. The clutch is probably of one to four eggs.*

[*Grallina cyanoleuca cyanoleuca*, Port Willunga, South Australia, Australia. Photo: Stewart Roper/ Lochman Transparencies]



*Both **Magpie-lark** parents brood and feed the chicks. There is a single report of co-operative breeding, where one male and two females occupied a single territory and bred several times over a period of more than two years. All three contributed to the tasks of nest-building, incubating the eggs, and feeding and brooding the young. In general, nests may be parasitized by several species of cuckoo (Cuculidae). Breeding success is moderate to rather low, with more than 50% of young dying as nestlings, or within a few weeks of fledging. In one survey, 405 out of 761 eggs hatched, and 227 young fledged. In another survey, 743 of 1099 nests produced at least one young, and the remaining failed, with predators a primary cause.*

[*Grallina cyanoleuca cyanoleuca*, Geelong area, Victoria, Australia. Photo: Peter Fuller]

rain has fallen to create durable surface water within its territory. The surface water provides a source of mud, which is used, together with strands of vegetation, to construct a relatively large cup-shaped nest about 15 cm in diameter and 8 cm deep.

Throughout the species' range, most egg-laying occurs in the austral spring and early summer, but there are records for all months. In southern parts of Australia, breeding normally commences following the onset of winter rain in June. In the south-west part of Western Australia, nest construction begins in July, and the first clutch is laid and incubation commences in August, about a month after the peak in winter rainfall. In south-east Australia, on the other hand, the winter is colder and nesting is delayed. In Canberra, for example, nest construction begins in late August, but most nests are started in September. Breeding can continue until December or even early January, several broods being raised. Heavy rain may initiate breeding at other times, and nests with chicks have been recorded in south-west Western Australia in April, after very heavy rainfall in February.

In the tropics of far north Queensland, the hours of daylight are relatively constant and rain may fall during most months but is least plentiful during the "winter". In this region, one observer recorded nesting in every month except April and June, over a period of 15 years. In inland Australia, where rainfall is episodic and may not occur at all during extended periods, Magpie-larks typically live only near persistent sources of water, such as billabongs (stagnant pools associated with temporary rivers), and troughs associated with water bore-holes. Nesting in these areas appears to take place in winter and spring, presumably because food items are more abundant in these seasons.

Magpie-larks are monogamous, having long-term, usually lifelong pair-bonds. There is a single report of co-operative breeding, in Melbourne, where one male and two females occupied a single territory and bred several times over a period of more than two years. All three individuals contributed to the tasks of nest-building, the incubation of the eggs and the brooding and feeding of the nestlings, and the provisioning of the fledglings. When one of the females was thought to have died, the remaining female and the male continued to maintain the territory.

Nests are usually situated towards the end of a branch, relatively high in a tree that is within 25 m of water and where mud is available. The majority of nest trees are located in the central area of a territory, but some are sited close to a boundary. Sometimes, mainly in areas lacking trees, artifical sites are utilized, examples being the tops of telegraph poles, windmills and the like, and, more rarely, airport towers, posts, the tops of streetlights, and poles supporting electricity cables. Both members of the pair construct the nest, but males devote more time to the task. They work mostly during the morning. Each bird collects mud and fibrous plant material and carries this in its beak to the nest, where it places it in position by rapidly vibrating its head from side to side. It then smoothes the mud by stroking the underside of its beak over the area. The outside of the nest is smoothed in the same way, and each partner presses its breast against the newly built mud walls in order to shape the inside of the bowl. Finally, the completed structure is lined with fine strands of vegetation and small feathers. The task of nest-building may be completed in a few days or over a period of more than three weeks. Second broods are relatively common, the adults either using the same nest or constructing a new one, and up to four broods have been recorded.

Mating usually takes place near the nest and occurs during, or shortly after, the time when the nest is being lined. The first egg is laid generally five to six days after completion of the nest, and a further egg is laid each day, the average interval being 1·2 days, until the clutch is complete. The clutch size ranges from one to six eggs, which have a pearly-white ground colour marked with reddish and grey spots. Incubation begins with the second egg, and lasts for 17–19 days. Both sexes incubate during the day, each sitting for about 25 minutes at a time, but the female sits on the nest through the night.

Young Magpie-larks are almost naked on hatching, having no more than a minimal amount of dark down along the main feather tracts. They remain within the nest for a period of some 19–23 days, and are brooded and fed by both parents throughout the day, the female again sitting during the night-time. The chick's first primary quills appear at 3–4 days, and the primary sheaths open at 7–8 days; by 14 days of age the chick is well feathered, and three days later its primaries are two-thirds out of the sheaths and the chick is able to flutter its wings while standing on the rim of the nest.

The adults, in order to encourage the young to leave the nest, often land some distance from it, while carrying food, and then call and display there. Eventually, one chick flies to join the parents, which feed it, and the other chicks soon follow. The young remain in trees or other vegetation for several days before first coming to the ground and following their parents for brief periods. Thereafter, they accompany the parents closely and beg for food, most often following the parent of the same sex. They continue to be fed for a further two weeks, before they start to catch food for themselves on the ground. After a further three weeks, the young, now about eight weeks of age, catch all of their own food and are no longer fed by the adults. They remain within the natal territory, but the parents become aggressive towards them, chasing and attacking the young if they approach, and the young begin to feed and roost separately. The offspring generally leave the territory and join juvenile flocks when about nine to eleven weeks old. Those leaving earliest tend to be the young of parents that have started to incubate the eggs of a second brood. In urban areas some young may remain in their parents' territory until the start of the next breeding season.

More than half of the young die either as nestlings or in the first few weeks after fledging, and for each breeding attempt generally only one or two young survive for long enough to leave the parents' territory.

Breeding success is moderate to rather low. Of 761 eggs in 216 nests throughout the Magpie-lark's Australian range, 405 hatched, and 227 of these hatchlings survived to the fledgling stage. In a sample of 1099 nests at which the outcome was known, 743, or 67·6%, produced at least one young and the remaining 356 failed. Predators are a major cause of nest failure. In particular, birds of prey such as the Red Goshawk (*Erythrotriorchis radiatus*), the Brown Falcon (*Falco berigora*) and others take chicks from nests, as do butcherbirds and, occasionally, Laughing Kookaburras (*Dacelo novaeguineae*), and snakes sometimes raid the nests. Young fledgling Magpie-larks fall prey to domestic cats and one was even caught and eaten by a dog, while another was captured by a Whistling Kite. In addition, nests are parasitized by Pallid Cuckoos (*Cuculus pallidus*), Channel-billed Cuckoos (*Scythrops novaehollandiae*) and Common Koels (*Eudynamys scolopacea*).

Movements

Virtually nothing is known about the movements of Torrent-larks, but the adults of this species are thought to be sedentary.

Adult Magpie-larks likewise are sedentary, and maintain permanent territories throughout much of the range of the species in Australia. Young disperse from their parents' territories and join flocks usually only a short distance away. There is a turnover of individuals within any flock, and it is assumed that birds leave and join other flocks nearby. The young form pairs within the flock, and a new pair will either establish a territory in the area used by the flock or leave the area, presumably to establish a territory elsewhere. It is not known how far such pairs may travel.

The longest recorded movement for the species is only 15 km, for an eight-month-old youngster. Magpie-larks are, however, regular non-breeding winter visitors to islands in the Torres Strait, between north-east Australia and south New Guinea, and occasional visitors to Tasmania. Moreover, they apparently arrived relatively recently in East Timor, and there is also a record of a single individual that turned up on Lord Howe Island in 1913. These records suggest that the species is capable of long-distance movements.

Very large flocks of Magpie-larks form in the dry season, from April to December, in northern Australia. The size of these flocks decreases as the wet season approaches, and Magpie-larks are absent from the region from December to the end of March. It is not known to where the birds go, but they may disperse southwards, to beyond the limits of the heavy seasonal rain.



*Young **Magpie-larks** are almost naked on hatching, with a thin dusting of dark down along the main feather tracts. The first primary quills appear at three to four days, and the primary sheaths open at seven to eight days. By 14 days, the chick is well feathered, and three days later its primaries are two-thirds out of the sheaths, and the chick is able to flutter its wings while standing on the rim of the nest. The juvenile has a black crown and a white stripe above the eye like an adult male, but a white throat and white area from the eye to the shoulder, like a female. Some begin the moult into adult plumage six to seven weeks after leaving the nest, while they are resident within their parents' territory. Most, however, start to moult ten or eleven weeks after fledging, shortly after leaving their parents' territory. The complete moult takes three to four months.*

[*Grallina cyanoleuca cyanoleuca*,
Beerwah, Queensland,
Australia.
Photo: Graeme Chapman]



*To encourage the young to leave the nest, adult **Magpie-larks** carrying food will land some distance away, and begin calling and displaying. Eventually, one chick will fly to the parent to be fed, and the rest soon follow. The young stay in the trees for several days after leaving the nest, before they descend to the ground and begin following their parents. They continue to be fed for a further two weeks, before they start to catch food for themselves. By eight weeks old, they are no longer fed by the parents. Although they remain in their parents' territories, the parents themselves are aggressive towards them. The young birds begin to feed and roost separately before, at nine to eleven weeks, they leave to join a juvenile flock.*

[*Grallina cyanoleuca neglecta*, Cairns, Queensland, Australia. Photo: Atsushi Matsui]

On the eastern side of Australia, the species leaves the high altitudes on the Great Dividing Range when cold temperatures and snow produce difficult and unsuitable conditions in the winter.

Relationship with Man

Torrent-larks inhabit rainforest and are considered to be scarce. They presumably, therefore, have little contact with humans. Nevertheless, there is a reference in the literature to the fact that some tribal people in New Guinea are wary of Torrent-larks, as they believe the birds to be associated with witchcraft.

In Australia, Magpie-larks have benefited from the extensive agricultural development that followed European settlement (see Status and Conservation). Historically, this grallinid has, in turn, been considered to be beneficial to agriculture, as it consumes a variety of invertebrate pests. The most important of these pests is a freshwater snail which is the intermediate host for a liver fluke that affects sheep and cattle. Unsuccessful attempts were made to introduce Magpie-larks in New Zealand, Hawaii and Fiji in the hope of reducing snail populations and the associated parasites there.

Status and Conservation

Both of the members of this family are considered not to be at any risk, at least in the immediate future. There is no suggestion in the literature that Torrent-larks are in decline or are in any way threatened as a result of human activities. They occur over a very large part of New Guinea in hill and mountain areas, and the remoteness and rugged nature of much of the terrain are likely to provide reasonably safe habitat for this species. The Torrent-lark seems to be fairly common throughout most of its range, but it has been said to be locally uncommon, at least in the eastern half of the island.

The Magpie-lark is a common and protected species over much of mainland Australia, where it is one of the most familiar birds in towns and on farms. It has benefited from the extensive agricultural and pastoral development that has occurred over much of Australia following colonization by Europeans. Historical reports suggest that, at the time when the first British settlers arrived, the species was restricted to habitats close to natural wetlands. Its populations then increased as the species dispersed into areas newly cleared for agriculture and where artificial sources of water and mud were provided. Thus, agricultural conversion and the clearing of natural vegetation, activities that have reduced the populations of many other species, as well as reducing species diversity in many areas, have enabled the Magpie-lark, conversely, to achieve a noticeable expansion of range and increase in numbers. The species has bred once in Tasmania, in 1903, but it is otherwise only a vagrant on that island.

Elsewhere in its range, the Magpie-lark is apparently numerous but local near the Bensbach River, in the Trans-Fly region of south New Guinea, but it seems not to have spread further afield. It is also resident in Timor, but no information is available on its numerical status there, although it seems to be locally common. The species is thought to be a relatively recent immigrant in these two areas.

In 1913 a Magpie-lark was recorded as a vagrant on Lord Howe Island, where the species was later introduced, in 1924, and is now well established and widespread on the island. Other attempted introductions, on the North Island of New Zealand, in Hawaii in 1922 and 1929, and in Fiji, have all been unsuccessful.

Finally, there are early records of the Magpie-lark from the small island of Luang, to the east of Timor, and from Tayandu Island, which lies about 200 km south of the western end of New Guinea. The Tayandu record was in 1899 and the Luang one was in 1905. The provenance of these individuals is uncertain, and there have, so far as is known, been no further records of the species from either island.

General Bibliography

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PLATE 14

inches 4
cm 10

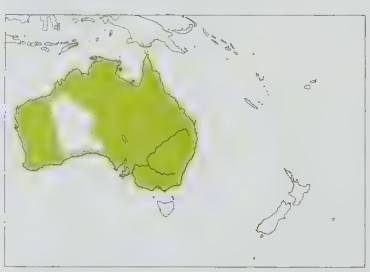
Genus *GRALLINA* Vieillot, 1816

1. Magpie-lark

Grallina cyanoleuca

French: Gralline pie **German**: Drosselstelze **Spanish**: Grallina Australiana
Other common names: Australian Magpie-lark, Little/Murray Magpie, Mudlark, Pied Grallina

Taxonomy. *C[orvus] cyanoleucus* Latham, 1801, Sydney, New South Wales, Australia.
Proposed and formerly widely used name *picata* is a synonym of nominate race by first revision (both names were simultaneously published for same taxon). Relationships of genus disputed; has in the past been thought to be closely related to the two species of Struthideidae, but genetic analyses indicate no such relationship; on basis of recent genetic studies, has been placed in drongo family (Dicruridae) or in monarch-flycatcher family (Monarchidae), and apparent close affiliation with latter supported by details of skull morphology; has also been suggested as being related, on basis of examination of skulls, to butcherbirds and currawongs (Cracticidae) and woodswallows (Artamidae) and, from comparison of egg-white protein, to the crows (Corvidae). Although many modern taxonomists favour placement of present genus with Monarchidae, and despite some similarities in external morphology, the two differ markedly in behaviour and nest structure. For the time being, it is considered best to retain the present family as a separate entity, although close relationship to Monarchidae appears very probable. Smaller race *neglecta* intergrades with nominate in N Australia (in broad band from C Northern Territory E to W & NC Queensland); was for long considered not worthy of recognition, but recent study suggests that biometric differences significant. Birds of this species on Timor and in S New Guinea of unknown racial identity; study needed. Two subspecies recognized.
Subspecies and Distribution.
G. c. neglecta Mathews, 1912 – N Western Australia (Kimberley) E to N Queensland (Cape York).
G. c. cyanoleuca (Latham, 1801) – W, C, E & S Australia.
Also (race unknown) on Timor, in E Lesser Sundas, and (possibly *neglecta*) in S New Guinea (Bensbach R area, in Trans-Fly region).
Introduced (nominate race) on Lord Howe I.



Descriptive notes. 25–30 cm; male 63·9–118 g and female 70–94·5 g (nominate), male 71–102 g and female 60–90 g (*neglecta*). Male has broad white line above eye, large white patch from ear-coverts down to side of neck; rest of head, and throat and upper breast glossy black; hindneck to rump glossy black, bases of scapulars white, uppertail-coverts white; tail white (appearing mostly black from above), broad black subterminal area (broadest on central feather pair, decreasing outwards, variable amount of black on outermost rectrix), tip white; upperwing black, most of secondary wing-coverts white, bases of inner secondaries white, tertials tipped white; underparts below upper breast white; iris white to pale straw-yellow or pale greyish; bill ivory-coloured to creamy, with blackish nasal groove and distal half of culmen; legs dark bluish-grey to blackish. Female differs from male in having forehead and throat white, a broad black band extending from black crown down side of face to chest, and behind this a broad white area from eye down to shoulder and meeting white of underparts. Juvenile appears to have mixture of features of male and female adults, with black crown and white stripe above eye (like male) but white throat and white area from eye down to shoulder (like female), also black parts of plumage dull, rather than glossy, iris dark brown (not white) and bill dark grey to black (not ivory with black tip). Races differ mainly in size: *neglecta* is smaller than nominate, with wing and tail of male significantly shorter than those of nominate, bill proportionately longer, also tends to have more black in outer tail (but this matched by some nominate). Voice. Loud and metallic vocalizations, of three main types: solo call, a monosyllabic or disyllabic note given by single individual, usually repeated a variable number of times at intervals of c. 1 second; antiphonal call, in which one member of pair gives solo call and its partner calls during the intervals in the series, producing highly synchronized sequence of alternating calls; third type is rapid call, in which individual repeats high-pitched "pee" or similar at rate of about four per second in relatively long sequence.
Habitat. Open vegetation, farmland, parks and gardens; requires surface water supply, and consequently is sparse in arid zones. In New Guinea, found beside rivers and lakes and in savanna. Lowlands, in Australia locally to 1000 m, occasionally to 1200 m.
Food and Feeding. Mainly invertebrates, including insects, spiders (Araneae), worms (Oligochaeta) and crustaceans; also small frogs, occasionally some seeds. Forages mainly on open ground, including edges of wetlands, exposed tidal flats, and lawns in urban areas. Walks along on ground or wades in muddy margins, opportunistically gleaning items; often stops and scratches a few times at ground, then moves backwards a little and snaps up prey thus uncovered. Seen to flush and pursue prey in grass, and to employ technique of "foot-trembling" on very wet mud in order to bring items to surface. Will seize aerial prey by sallying briefly into air, usually from ground but sometimes from low perch. Very active, constantly calling and fluttering about. Singly or in pairs; young form flocks of variable size.
Breeding. Timing related to rainfall, availability of mud for nest construction, daylength and probably temperature: in SW Western Australia commences nest-building in Jul, egg-laying Aug, but unseasonal heavy rain known to initiate nesting in Apr; in SE of country (Canberra, where winter wet and cold) building late Aug, laying Sept; in tropical far N Queensland (dry winter, wet summer) nesting recorded in all months except Apr and Jun; second broods common, and up to four broods recorded. Monogamous, with long-term pair-bond; single report of co-operative breeding (in Melbourne), with male and two females, all three contributing to nest-building, incubation of eggs, brooding and feeding of nestlings, and provisioning of fledglings. Solitary nester, pair maintains permanent territory. Nest constructed by both partners, an open cup or bowl made from mud and fibrous plant material, lined with fine strands of vegetation and small feathers, placed 5–20 m above ground, occasionally higher, usually on outer part of tree branch, sometimes on man-made structure (e.g. telegraph pole, other pole, lamppost); nest reused or new one constructed for subsequent brood. Clutch 1–6 eggs; incubation by both sexes, period 17–19 days; chicks brooded and fed by both parents, leave nest at 19–23 days; young fed by both adults until c. 14 days after fledging, fed less thereafter, and independent c. 5 weeks after fledging; young remain within natal territory, but parents attack them if they approach, and offspring generally leave and join juvenile flocks when c. 9–11 weeks old. Nests parasitized by Pallid Cuckoo (*Cuculus pallidus*), Channel-billed Cuckoo (*Scythrops novaehollandiae*) and Common Koel (*Eudynamys scolopacea*). Breeding success moderate to rather low, and more than 50% of young die as nestlings or within few weeks of fledging; of 761 eggs in 216 nests throughout Australian range, 405 hatched, and 227 young fledged; of 1099 nests at which outcome known, 743 (67·6%) produced at least one young and remaining 356 failed; predators a primary cause of nest failure. Age at first breeding 2 years. Lifespan 10 years or longer.
Movements. Mainly resident, with some local movement; partly migratory in some areas. Adults usually sedentary within territories over most of range. Seasonal occurrence in tropical N Australia (absent in wet season) and at high altitudes (absent in winter); observations suggest that most, if not all, individuals (including adults) leave area around Darwin, in Northern Territory, before or soon after onset of wet season, but extent of movements unknown. Young disperse from parental territories and form flocks nearby, from which pairs disperse; distance travelled by new pairs seeking territories unknown. Regular non-breeding visitor to islands in Torres Strait, and occasional visitor to Tasmania. Capable of long-distance movements, as occasionally recorded on islands distant from mainland Australia; apparently colonized Timor from Australia, and single individual recorded on Lord Howe I (600 km off E Australia) in 1913. Old records from Luang I (E Lesser Sundas) in 1905 and from Tayandu I (SE Moluccas) in 1899 presumably refer to vagrants.
Status and Conservation. Not globally threatened. Common to abundant over much of Australia, where one of the most familiar birds in towns and on farms; locally common in S New Guinea; no recent information on status in Timor, but thought to be locally common. Has benefited from extensive agricultural and pastoral development over much of Australia following colonization by Europeans. When first settlers arrived, this species was apparently restricted to habitats close to wetlands; it then dispersed into areas cleared for agriculture and where artificial sources of water

were provided, enabling it to achieve a noticeable expansion of range and increase in numbers. Has bred once in Tasmania, in 1903. Introduced on Lord Howe I in 1924, and now well established and widespread there; attempted introductions in New Zealand (on North I), in Hawaii and in Fiji all unsuccessful.

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2. Torrent-lark

Grallina bruijni

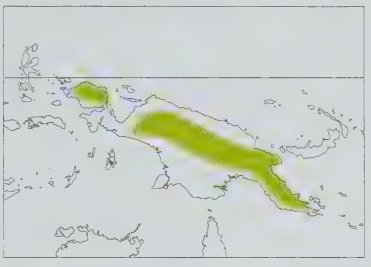
French: Gralline papoue **German**: Trugstelze **Spanish**: Grallina Papú

Taxonomy. *Grallina bruijni* Salvadori, 1876, Arfak Mountains, north-western New Guinea.

Relationships of genus disputed; has in the past been thought to be closely related to the two species of Struthideidae, but genetic analyses indicate no such relationship; on basis of recent genetic studies, has been placed in drongo family (Dicruridae) or in monarch-flycatcher family (Monarchidae), and apparent close affiliation with latter supported by details of skull morphology; has also been suggested as being related, on basis of examination of skulls, to butcherbirds and currawongs (Cracticidae) and woodswallows (Artamidae) and, from comparison of egg-white protein, to the crows (Corvidae). Although many modern taxonomists favour placement of present genus with Monarchidae, and despite some similarities in external morphology, the two differ markedly in behaviour and nest structure. For the time being, it is considered best to retain the present family as a separate entity, although close relationship to Monarchidae appears very probable. Present species has in the past sometimes been placed in a different genus, *Pomareopsis*, but no apparent justification for generic separation from *G. cyanoleuca*. Monotypic.

Distribution. Hills and mountains of New Guinea.

Descriptive notes. c. 20 cm; male 40–41 g, female 38–40 g. Male has white line above eye, large white patch from ear-coverts down to side of neck; rest of head, upperparts to rump, and throat and breast black; uppertail-coverts and undertail-coverts pale buff, tail buffy white basally with broad black subterminal band; upperwing black, most of secondary wing-coverts white; lower underparts white, undersurface of wing black; iris dark brown; bill lead-grey to pale blue-grey, tip whitish; legs blue-grey. Female differs from male in having black head with white band extending from base of bill through and above eye and expanding onto side of neck; breast and underwing-coverts white; flanks and lower abdomen pale buff. Juvenile is similar to female, but has area between base of bill and eye black, and remaining dark areas of plumage very dark brown (instead of black). Voice. Loud, penetrating, buzzy call notes "jjirrreee" or "bzzzeee", or series of notes, often considered harsh and unpleasant, also upslurred calls, far-carrying and clearly audible against background noise of streams. Male recorded as giving nasal, buzzy "k-zaaat" during raised-wing display.



Habitat. Near small, fast-flowing streams in rainforest and open grassland, mainly between 400 m and 2300 m; to 2800 m in Snow Mts.

Food and Feeding. Invertebrates; small lizards occasionally caught and eaten. Forages on ground, mostly at edges and on exposed rocks and gravels of streams and on roads; mainly in shallows of streams, searching among boulders and fallen trees in and beside rushing water; takes items from surface of water. Sometimes captures aerial prey by sallying briefly into the air, usually from ground but sometimes from low perch. Very active, constantly calling and flying about; persistently wags tail from side to side, also fans wings. In pairs or small parties.

Breeding. Few observations. Nests recorded Jun–Jan, predominantly dry season. Nest cup-shaped, made from mud and rootlets, placed on branch of tree or bush close to stream; clutch probably 1–4 eggs. No other information.

Movements. Very little information. Adults believed sedentary, juveniles presumably dispersive; some altitudinal movement possible. Individuals or groups travel between streams.

Status and Conservation. Not globally threatened. Fairly common throughout most of range; perhaps locally uncommon, at least in E half of range. Distributed over large part of New Guinea in hill and mountain areas, and habitat likely to be reasonably secure owing to remoteness and rugged nature of terrain. Considered not to be at any risk, at least in immediate future.

Bibliography. Beehler (1978b), Beehler *et al.* (1986), Coates (1990), Gyldenstolpe (1955a), Iredale (1956), Mayr (1931c), Mayr & Gilliard (1954), Mayr & Rand (1937), Rand & Gilliard (1967), Rothschild (1931), Sharpe (1877).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family STRUTHIDEIDAE (AUSTRALIAN MUDNESTERS)



- Medium-sized, largely terrestrial passerines with shortish, rounded wings and long, sturdy legs; dull plumage.
- 29–50 cm.



- Eastern Australia.
- Open woodland.
- 2 genera, 2 species, 4 taxa.
- No species threatened; none extinct since 1600.

Systematics

The type specimen of the White-winged Chough (*Corcorax melanoramphos*) was collected in New South Wales, in east Australia, and was described by L. J. P. Vieillot in 1817 as a roller (Coraciidae). The description does not specify the precise locality where the bird was taken, but it was probably near Sydney. Two years later, J. R. C. Quoy, on his way to Bathurst from Sydney, reported that "on the heights one finds the black chough with white wings, a stupid animal, armed with sharp talons". In 1820, C. J. Temminck, presumably unaware of Vieillot's description, placed it in the same genus as the Alpine Chough (*Pyrrhocorax pyrrhocorax*), a member of the crow family (Corvidae), and gave it the name *Pyrrhocorax leucopterus*, which led to the common vernacular name of White-winged Chough. In 1830, R. P. Lesson considered that this bird merited its own separate genus, and the species received a third name, *Corcorax australis*, and was placed in the family Corvidae.

It was not until twenty years after Vieillot's original description of the White-winged Chough that the Apostlebird (*Struthidea cinerea*) was collected for the first time, again in New South Wales, when the Blue Mountains were penetrated and the inland plains reached. The first specimen was described by J. Gould in 1837 as having come from the interior of New South Wales, and it had probably been sent to him by Mrs Gould's brothers, Stephen and Charles Coxen, who had settled in the Hunter Valley. The earliest field description is that of J. Gilbert, who was surprised to see a *Struthidea* approach and sit on what he had presumed to be a magpie-lark (*Grallina*) nest; this was also the first record of the use by *Struthidea* of a mud nest.

Three Australian bird species build mud nests. These are the White-winged Chough, the Apostlebird and the Magpie-lark (*Grallina cyanoleuca*), and this shared trait has confused the systematic position of the three genera concerned. The family affiliations of the three species were uncertain from the time of their description until, in the latter part of the twentieth century, DNA studies shed some light on their probable relationships. Although Lesson placed *Corcorax* in the Corvidae, Gould was not prepared to assign *Corcorax*, *Struthidea* and *Grallina* to known families and, in his 1865 *Handbook*, he listed each one with the note "Family ?". For many years, *Corcorax* and *Struthidea* were included in the Corvidae, but later authors did not recognize the similarities between the two groups and placed them in separate families. The authors of the 1926 checklist of the Royal Australasian Ornithologists Union placed *Corcorax* in the Corvidae, *Struthidea* in a monotypic family Struthideidae, and *Grallina* on its own in the Grallinidae. Soon thereafter, G. M. Mathews, in his 1931 list of the birds of Australia, had three families for the mudnesters: Corcoracidae, Struthideidae and Grallinidae. Two decades later, however, D. Amadon placed *Corcorax* and *Struthidea* together with the Magpie-lark in the family Grallinidae on the basis of the substantial bowl of mud which all three genera build for the purpose of nesting.

Initial genetic evidence from DNA studies undertaken by C. G. Sibley and J. E. Ahlquist suggested that *Corcorax* and *Struthidea* were elements of an old corvoid lineage, each the closest relative of the other, but quite divergent, and both more distant from *Grallina*, which appeared to be a monarch-flycatcher (Monarchidae). These authors placed *Corcorax* and *Struthidea* in a subfamily Corcoracinae of a greatly expanded family Corvidae. Later DNA studies have supported the finding that *Corcorax* and *Struthidea* are related genera in a separate lineage of the core Corvoidea, and current usage in Australia treats them as constituting one of a number of core corvoid families. Their closest relatives appear to be the birds-of-paradise (Paradisaeidae) and the butcherbirds (Cracticidae).

The name of the family consisting of *Corcorax* and *Struthidea* alone has normally been listed as "Corcoracidae", but in fact the name "Struthideidae" has priority. Both names were coined by Mathews in the 1920s, but the latter is older by one year and is therefore the valid name for the family thus constituted.

Mathews, in 1912, described three subspecies of the White-winged Chough and three of the Apostlebird. Since then, however, most authors have not recognized any races of either species. Nevertheless, R. Schodde and I. J. Mason, in *The Directory of Australian Birds*, published in 1999, recognized two subspecies of each of the struthideids. In the case of the White-winged Chough, the nominate race is found in most of the species' range, but is replaced in southern South Australia by the subspecies *whiteae*; the two intergrade in the region of the the Mount Lofty Ranges. There appear to be no differences between the two northern populations of the Apostlebird, although they occupy discrete ranges, one in the north part of the Northern Territory and the other in the southern Cape York Peninsula, in Queensland.



*The **White-winged Chough** and the Apostlebird* (Struthidea cinerea) *are medium-sized passerines, with drab plumage and no sexual dimorphism. In the past, they were grouped with the mudlarks* (Grallina) *in the family Grallinidae, on the basis that all three genera build substantial mud nests. The White-winged Chough and the Apostlebird are now recognized as each other's closest relations, well distanced from* Grallina. *Their closest relatives appear to be the birds-of-paradise (Paradisaeidae) and the butcherbirds (Cracticidae). The name of this family as constituted herein has normally been given as "Corcoracidae", but in fact "Struthideidae" has priority and is thus the valid name.*

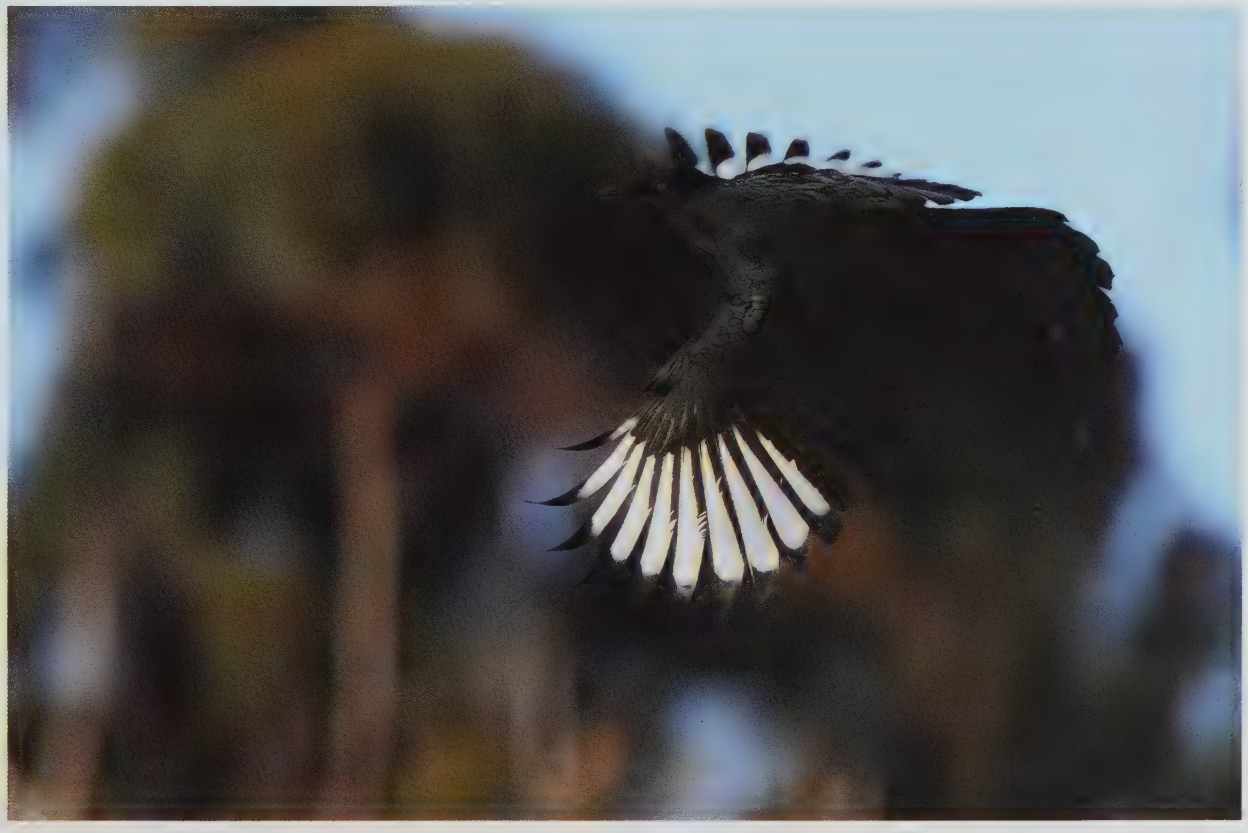
[*Corcorax melanoramphos melanoramphos*, Lara, Victoria, Australia. Photo: Peter Fuller]

Both are therefore included in the subspecies *dalyi*, which intergrades with the nominate race in an area running from north-east to south-west in north-central Queensland, more or less along the low divide between the northern and inland rivers.

Northern populations of the Apostlebird have sometimes been referred to as race *swainsoni*, but this is inadequately described and may possibly be based on an intermediate specimen. Not only are the description and measurements of the type specimen ambiguous, but the type locality, given as north Queensland, is insufficiently precise and could refer to a place within the zone of intergradation between the two subspecies. Although *swainsoni* was first described by Mathews in 1912, eleven years earlier than *dalyi*, it is therefore deemed an invalid name.

Morphological Aspects

Both the White-winged Chough and the Apostlebird are medium-sized typical passerines, with drab plumage and no external sexual dimorphism. The White-winged Chough is the larger of the two



*The **White-winged Chough** is the larger of the two species, with an average overall length of about 47 cm and a weight of around 350 g. The struthideids have relatively short, rounded wings and are not strong fliers. The tail is long and bulky, and rounded at the tip. Adult White-winged Choughs have entirely matt black plumage, except for a glossy sheen on less worn feathers of the head, wing and tail; and a white wingpanel across all ten primaries, only visible when the bird is flying or displaying. The primaries do not reach their maximum size until the bird is in its fourth year.*

[*Corcorax melanoramphos melanoramphos*, Lara, Victoria, Australia. Photo: Peter Fuller]



*The bill of the **Apostlebird** is short and deep, resembling that of a finch (Fringillidae). The smaller of the struthideids, at 29–33 cm and 110–155 g, its plumage is mostly grey, with brown wings, and a blackish tail with a greenish gloss. The rather pointed feathers on the head and neck, with paler tips, give a shaggy appearance. The bill, gape, legs and feet are black. Both struthideids are birds of relatively open habitat, such as eucalypt woodland, shrubland and open-canopy forest, in temperate, tropical and semi-arid areas. The Apostlebird is found only west of the mountains of Australia's east coast, extending well into arid areas. It becomes bold and tame around modified habitat such as farms and picnic grounds.*

[*Struthidea cinerea dalyi*, Chillagoe, Queensland, Australia.
Photo: Rohan Clarke]

species, about the size of a *Corvus* crow, with a typical length of 47 cm and an average body mass of approximately 350 g. The Apostlebird is smaller, having a maximum length of 33 cm and a mean body mass of about 130 g. Both species show the morphological characteristics generally found in birds that forage mainly on the ground, having long, sturdy legs, with feathered tibia, and relatively short, rounded wings. They are not strong fliers.

The two species are similar in body proportions, with a similar ratio of wing length to tarsus length, that of White-winged Choughs being 3·9 and that of Apostlebirds 3·8. The White-winged Chough has a tarsus length of 61 mm and a wing length of 237 mm, with ten primaries and eleven secondaries. In the case of Apostlebirds, the tarsus length is 39 mm and the wing 148 mm, and there are ten primaries and nine or ten secondaries. The tip of the folded wing reaches just past the uppertail-coverts. The tail is long and bulky, and rounded at the tip, and consists of twelve graduated rectrices. That of the Apostlebird, at 153 mm, is relatively longer than that of the larger White-winged Chough, at 205 mm.



*Both struthideids live in groups which travel, feed and roost together. A group of **White-winged Choughs** may forage over a home range of 10 km^2. Encounters between groups are infrequent, but when they occur, the birds threaten and display at each other, giving loud piping calls. In the "Wing-wave Tail-wag" display, the bird spreads its wings, making the white patches conspicuous, and fans its tail, moving both tail and wings up and down about once per second. At the same time, the conjunctiva of the eye becomes engorged. Displays do not last long, and groups may then feed in sight of each other.*

[*Corcorax melanoramphos melanoramphos*, Hattah-Kulkyne National Park, Victoria, Australia.
Photo: Rob Drummond/ Lochman Transparencies]



Ringing studies have shown that social groups of struthideids are formed largely by young birds remaining within the family for several years after they have become independent foragers. Both species are sedentary, with a core area of about 20 ha which they defend against other groups while breeding, and a much larger home range once the young are fledged. ***Apostlebird*** *home ranges extend to 3–4 km², and groups vary from three to 19 individuals. Groups break up at the death of the senior male or female. The remaining breeding bird, accompanied by immatures of less than four years, will join a lone bird of the opposite sex to form a new group. Individuals or coalitions from different groups may also come together to form a new group.*

[*Struthidea cinerea cinerea*, Hattah-Kulkyne National Park, Victoria, Australia. Photo: Dean Ingwersen]

In contrast to the features revealing similarities between the two members of the family, the bills of the two species are very different, reflecting differences in the mode of feeding. The White-winged Chough's bill is long, 49 mm, slender and decurved, with a pointed tip, whereas the Apostlebird has a short, deep bill 26 mm in length and resembling that of a finch (Fringillidae).

Although the Struthideidae share many skeletal features with other corvoids, they have several characteristics of the skull that are distinctive. For example, *Corcorax*, the White-winged Chough, has a weakly ossified upper mandible with the naris extensively aperturate and the nasal bars narrow, and there is a large nasal vestibule as the maxillo-palatine processes are long and thin and extend over the vomer, which is dorsoventrally compressed. The ectethmoid plate is fused laterally to the frontal, and the temporal fossa is very broad and shallow, and with its processes greatly reduced. In addition, *Corcorax*, as it reaches adulthood, acquires a sclerotic ring around the outer edge of the iris; when the bird is excited, or when it is in an aggressive mood, this ring becomes bright red as blood flows into it. The Apostlebird, *Struthidea*, likewise has a sclerotic ring, but in this case it is greatly reduced. It differs further from *Corcorax* in having, among other characteristics, a much more heavily ossified skull, with a more cylindrical vomer bordered by thickly crested maxillo-palatine processes, and a foreshortened palatal cavity with a broader palatine shelf.

Adult White-winged Choughs have an entirely black plumage apart from a white wingpanel across all ten primaries. This panel, the size of a tennis-ball, is visible only in flight. The dark plumage appears matt black, except for a slight bluish-green sheen on less worn feathers on the head, the tip of the tail and the wing. The entire plumage becomes browner with wear. The bill, legs and feet are blackish, and the inside of the mouth is dark grey. The eye colour of White-winged Choughs changes with age, until the fifth year is reached. From observations of individuals of known age that were recaught and photographed, I. Rowley determined an age scale based on the colour of the iris at the middle of each year. Thus, in the first year the iris is entirely brown; in the second year it is brown with an orange outer ring, being more brown than orange; the third year is indicated by an orange iris with a brown inner ring, the iris being more orange than it is brown; fourth-year individuals have an orange iris with brown flecks in a yellow inner ring; and in the fifth year and subsequently the iris is orange and red. Juvenile White-winged Choughs exhibit two rows of buff supraorbital down on the head, these persisting for the first 65 days of the bird's life; after that, the young are indistinguishable in the field from other choughs, except for the colour of the eyes.

Apostlebirds are predominantly grey, with paler tips on the feathers of the head and neck and some streaking over the rest of the body. The wings are brown, with paler fringes on most of the feathers, and the dark tail has a greenish gloss. The bill, gape, legs and feet are blackish. Juveniles appear similar to adults, but the feathers of the head and body are softer, with a looser texture, and the streaking is less marked. As with the White-winged Chough, eye colour changes with age, and G. Chapman showed that for the Apostlebird the main development takes three years: for the first year the iris is brown; in the second year it is grey; and in the third year a thin pearly outer ring develops. This outer ring becomes larger as the individual ages further. When an Apostlebird is excited, the iris becomes reddish-brown.

Adult White-winged Choughs have a complete post-breeding moult, which takes place from late spring to mid-autumn. Juveniles of this species replace their body feathers and wing-coverts in a partial moult about two months after fledging; the resulting immature plumage is less glossy and slightly browner than that of adults. At about one year of age, at the time of the adult post-breeding moult, immatures moult into the adult plumage, and are then distinguished from the adults only by eye colour. Immatures do not achieve their full dimensions until they are three or four years old. Bone growth, as measured by tarsus length, is completed early, but the bill continues to grow for two years. After the first moult the new tail feathers are longer than those which they have replaced, but thereafter the length of the rectrices remains constant. The primaries do not reach their maximum size until the bird is in its fourth year, and the body mass does not stabilize until it reaches adulthood, at more than four years of age.

The Apostlebird undergoes a complete post-breeding moult over a period of about four months at some time between late spring and early autumn. The primaries and the tail are moulted



White-winged Choughs *rest and roost together, generally in the canopy of a large tree, perching side by side and facing into the wind. As well as preening themselves, both White-winged Choughs and Apostlebirds* (Struthidea cinerea) *preen each other, especially those parts of the head, neck and underwing that are hard for the individual to reach on its own body. This social preening, or allopreening, is an important part of the group's social behaviour. On some evenings White-winged Choughs will dust-bathe, using the bill to collect fine dust and deposit it at the bases of the body feathers. All members of the group dust together, becoming very excited.*

[*Corcorax melanoramphos melanoramphos*, Stanthorpe, Queensland, Australia.
Photo: Graeme Chapman]

outwards. Young of this species fledge in a juvenile plumage, which is replaced by an adult-like immature plumage some months after fledging. Only the eye colour distinguishes them from adults.

Habitat

The two species of the family Struthideidae are birds of relatively open habitats. White-winged Choughs live in areas of eucalypt (*Eucalyptus*) woodland or dry eucalypt forests with a sparse understorey of shrubs or grass. Most of this species' range lies within temperate, subtropical and semi-arid areas, reaching the tropics in the north and the arid zone in the western and south-western limits. The nominate race of the White-winged Chough is often found in plantations of exotic pines (*Pinus*), in well-wooded farmland and in suburban areas with well-established parks and large gardens, as well as in uncleared forest and woodland.

Apostlebirds are found only west of the mountain ranges of the east coast, from temperate to tropical regions, where they extend farther into the arid areas. They occur in a variety of habitats, including arid acacia (*Acacia*) woodlands and shrublands, and semi-arid cypress-pine (*Callitris*) or eucalypt woodlands.

Both members of the family are tolerant of some habitat modification. They can be found in parks, in camping areas and on the modified fringes of towns, although they generally do not enter smaller suburban gardens.

General Habits

One of the striking features of the Struthideidae is the fact that both species live in groups and breed co-operatively. They travel around, feed and roost together in small parties. In Rowley's study of White-winged Choughs near Canberra, in the south-east of the species' range, groups consisted of 2–14 individuals, with a mean of six, although groups of up to 20 have been recorded. In two studies of Apostlebirds in similar habitats in mid-western New South Wales, groups were found to contain, respectively, 3–19 individuals, with a mean of nine, and 3–17 individuals, with a mean of 7·6. Ringing studies of both species reveal that the social groups are formed largely through the retention of progeny within the family for several years after they have become independent foragers, and even after they reach sexual maturity. In the breeding season, these additional birds assist in nest-building, incubation, brooding, and the feeding of nestlings and fledglings. With both species, groups may include more than one adult of each sex, although, in most cases, only one pair breeds. The studies made by R. G. Heinsohn showed that it takes four years for individual White-winged Choughs to become efficient enough at foraging to have the spare capacity to feed young.

Groups break up at the death of the senior male or female. When this happens, the remaining breeder, accompanied by immatures less than 4 years old and of either sex, then join a lone mature adult of the opposite sex to form a new group. In the case of Apostlebirds, groups may be created also by the amalgamation of individuals or coalitions from different groups. A phenomenon noted for both species was that, on rare occasions, dispersing individuals formed simple pairs.

Both members of the family are sedentary, remaining resident in the same area from year to year. Each group maintains a territory of approximately 20 ha, which it defends against the members of other groups during the breeding season. Once the young are fledged and mobile, the group is less restricted and may forage over a much larger home range, extending to about 10 km² for White-winged Choughs and 3–4 km² for Apostlebirds; a group's foraging range may overlap with those of other groups.

Several groups may accumulate into a large flock, sometimes of up to 100 individuals, at an especially good food source, such as an oat stubble in the case of the White-winged Chough. Within such flocks the constituent groups maintain their identity and, if disturbed, they fly off as separate groups. Local movements within the home-range areas are probably influenced by the availability of food sources and the occurrence of water, the latter being necessary for the building of a mud nest (see Breeding), as well as for drinking. In the heat of summer, several groups of Apostlebirds may congregate close to a permanent water supply. Sometimes the birds drink twice in a day.

White-winged Choughs are weak fliers. Indeed, they resort to the air only for travelling and for escape. They forage on foot, covering 5–6 km in a day. They drink at least once in the day, flying to water, but approaching the water warily on foot; one

individual always remains alert, with the head raised, acting as a sentry. On some evenings White-winged Choughs will indulge in dust-bathing, for which they insert the bill into narrow ditches and extract a billful of fine dust, which they deposit at the bases of their body feathers. All members of the group dust together, becoming very excited in the process. White-winged Choughs also roost together, generally in the canopy of a large tree, where they perch side by side and facing into the wind.

Similarly, Apostlebirds spend most of their active time on the ground, foraging in noisy groups. As they walk or run, the long tail sways from side to side; they also hop, the tail then flicking up and down. They travel longer distances to or from cover or a perch by flying with active wingbeats interspersed with gliding. Apostlebirds have not been reported as dust-bathing, but a smell of ants is common to many captured individuals of this species, and behaviour suggestive of anting has been observed. Apostlebirds are very cautious when going to roost, usually not settling until after dark, when they perch together in a dense shrub, side by side, usually in bodily contact with one another. During the hot part of the day they often rest in a huddle formation, pressed tightly against one another.

As well as preening themselves during periods of rest, in the middle of the day or before going to roost, both White-winged Choughs and Apostlebirds preen each other, especially in those parts of the head, neck and underwing which are hard for the individual to reach on its own body. This social preening, or allopreening, is an important part of the group's social behaviour.

Encounters between groups of White-winged Choughs over their large, overlapping foraging ranges are infrequent. When they do occur, however, the two groups threaten and display at each other and give loud piping whistle calls. In the full display, named the "Wing-wave Tail-wag" (WWTW) by Rowley, the bird partly spreads its wings and fans the tail, moving both up and down about once per second; the white wing patches are then highly conspicuous. At the same time, the conjunctiva of the eye, the membrane covering the outer surface of the cornea, becomes engorged and the two protruberant scarlet eyes enhance the threat. When two groups first meet, the two primary males may advance towards each other and perform an early stage of this threat display, with the head held lowered, the tail raised and partly fanned, and the eyes engorged. Later, the whole group may face the intruders, giving the full display accompanied by very noisy piping whistles. Displays do not persist for long, and the opponents will often then feed within sight of each other. Groups which approach one another but do not quite meet may enter into a battle only of sound, consisting of loud piping whistles.

So important to a group's reproductive success is the presence of helpers that groups may even kidnap recent fledglings from another group. Heinsohn, who observed this phenomenon during his detailed studies of White-winged Choughs, described the way in which recently fledged, highly dependent young, in the course of aggressive display battles between groups, transferred from one group to the opposing one during the encounter. The kidnapped young were enticed away from their own group and herded away by the marauders, this even before the young were able to fly. Some of the kidnapped young returned to their own group within a few days. Others, however, remained with their captors, and were later watched as they helped to feed the unrelated young in their new group.

The WWTW display has been recorded in many other contexts. If an incubating adult was slow to come off the nest when a relieving individual arrived, the latter would embark on a WWTW display that provoked the sitter to rise from the eggs and respond. As soon as it did so, the relieving individual poked its head under the sitter's body and replaced it on the nest. The display can be given by an adult to an unsated youngster after it had been fed, or to an individual rejoining a group after having lagged behind. The Wing-wave Tail-wag is also incorporated into a display apparently given only when the group is attacked by the very aggressive Australian Magpie (*Cracticus tibicen*). Australian Magpies hold group territories of about 4 ha, which they defend throughout the year. In the course of a day's foraging, a group of White-winged Choughs is likely to infringe upon many magpie territories, where it is subjected to vigorous attack. Choughs are heavier than Australian Magpies, but they are also slower, less agile fliers, and a single chough is no match for a magpie, whose main form of attack is a repeated rapid swooping on its victim. Chough groups employ a method of defence that Rowley named the "plum-pudding" display. In this, the members of a group on which the magpies are swooping run together and form a large clump; they then face in the direction of the attack and perform the Wing-wave Tail-wag display, which increases their apparent



Apostlebirds *spend most of their active time on the ground, foraging in noisy groups. This group-living is indeed the origin of their vernacular name. Outside the breeding season, at a particularly good food source, several groups may accumulate into a large flock of up to 100 individuals. Within such a flock the groups maintain their identity, and fly off separately if the flock is disturbed. Several groups of Apostlebirds may also congregate close to a permanent water supply. Encounters between groups tend to provoke a threat display, with arched neck, spread tail, and spread and lowered wings. When Apostlebirds walk or run, the long tail sways from side to side.*

[*Struthidea cinerea cinerea*, Sturt National Park, New South Wales, Australia. Photo: Dave Watts/ Lochman Transparencies]

size and shows off their white wing patches and engorged red eyes, while at the same time they call loudly. Magpies do not press home an attack against such a large and noisy clump of choughs, whereas they will easily drive a lone individual out of their territory. So far as is known, this display is not directed at any species other than the Australian Magpie.

Observed encounters between groups of Apostlebirds have usually involved calls and threats, which were enough to repel an encroaching neighbouring group. Sometimes these encounters end in fighting, with pecking and claw-grappling by one or more birds of each group. In the threat display, the Apostlebird arches its neck, lowers and spreads its wings and spreads its tail, while holding the back feathers erect and other body feathers fluffed. The threatening individual often runs at its opponent, making harsh "kreech" calls. Threats can be directed at intruders or at other members of the group, as by a dominant individual towards a subordinate one. In less intensive threats, the feathers are fluffed and the tail is slightly fanned. Potential predators, such as birds of prey and the large lizards known as goannas (*Varanus*), are mobbed by the whole group, with threats and aggressive "kreech" and "chee-ow" calls. If the predator is in a tree, the Apostlebirds surround it while calling and swooping, pecking and clawing at the threat.

Various types of behaviour exhibited by White-winged Choughs and Apostlebirds have been interpreted as being play, generally between first-year birds and adults. They include play-fighting, tug-of-war, chasing, and the manipulating of small branches, flowers and stones.

Voice

Neither of the struthideids has what would be considered a song in the usual ornithological sense of the word. Nevertheless, both species are vocal, this being particularly true of the Apostlebird.

The most characteristic vocalization of the White-winged Chough is a clear piping whistle, usually descending in pitch and ventriloquial in character. The calling individual sounds as if it is either close to or far from the human observer, depending on the position of the bird's head and bill. There are shorter and softer variations of this call, and a variety of harsher churring calls is given in threat, while foraging or during the change-over of incubating adults. When captured, White-winged Choughs emit an ear-piercing shriek when they are handled by humans.

Apostlebirds are highly vocal, having a great variety of calls based on "kreech", "chee-ow" or "churr" sounds, all raucous and harsh. This species is rarely silent, chattering noisily in most circumstances.

Food and Feeding

Both White-winged Choughs and Apostlebirds forage predominantly on the ground. A survey of the diets of Australian bird species, undertaken by R. D. Barker and W. J. M. Vestjens, revealed that the two struthideid species consume a wide range of insects and seeds.

The White-winged Chough uses its bill to rake through leaf litter and turn over branches, followed by probing for insects. It also digs in soil and under tussocks and cowpats. The individuals in a group forage 1–2 m apart from one another, and in this way the group efficiently covers a large area. This species may also take advantage of other food, and it has been recorded as probing in the mud of a creekbed for freshwater mussels (of the family Hyriidae), which it prised open with the bill or smashed against a rock. Apostlebirds likewise forage as a group, the birds digging in the ground, turning over litter, and picking up seeds. They also extract seeds from the cones of the native cypress-pine, and they forage in trees, taking insects from under bark and removing eggs from the nests of other birds. During a plague of house mice (*Mus musculus*), J. N. Hobbs watched both White-winged Choughs and Apostlebirds as they chased mice from under grass tussocks in open paddocks, grabbed them by the neck, and beat the small mammals against the ground until they could be consumed.

The detailed studies of White-winged Choughs and Apostlebirds suggest that the mode of feeding employed by these two species involves a high degree of skill and is time-consum-



Struthideids consume a wide range of insects and seeds, the former predominating in summer and the latter in winter. The ***White-winged Chough*** *uses its bill to rake through leaf litter and turn over small branches, before probing for insects. It also digs in soil, and under tussocks and cowpats. Struthideids will also take small mammals. During a plague of house mice* (Mus musculus), *both species were seen to chase mice from under grass tussocks, grab them by the neck, and beat them against the ground before swallowing them. The White-winged Chough has also been recorded probing in the mud of a creekbed for freshwater mussels, which it prised open with the bill, or smashed against a rock.*

[*Corcorax melanoramphos melanoramphos*, Hattah-Kulkyne National Park, Victoria, Australia. Photo: Rob Drummond/ Lochman Transparencies]

ing. Juveniles are slow to learn the required techniques, and also to make the seasonal changes from a predominantly insect diet in the summer to a diet mostly of seeds in the winter.

Breeding

Groups occupy breeding territories in more or less the same places each year. Two conspicuous features of the breeding behaviour of the White-winged Chough and the Apostlebird are that both species construct sturdy conspicuous mud nests and both breed co-operatively. Co-operative breeding is characterized by the presence of both breeding adults and non-breeding, mature individuals in a social group. The non-breeders are usually termed "helpers", and in the case of the Struthideidae they contribute by assisting in the tasks of nest-building, the feeding of nestlings and caring for fledglings, as well as attacking or distracting predators and in general territory defence. Within such groups, the patterns of mating are often unknown, but both the White-winged Chough and the Apostlebird have been the subject of detailed studies in respect of their social and mating systems. In the case of White-winged Choughs, the studies by Heinsohn and others have shown that, in groups that had been stable for many years, breeding was by a single monogamous pair, all eggs being laid by the female of this pair and fertilized by the male. These groups did not receive immigrants, and their members were generally closely related to one another, many or all being offspring of the breeding pair. After high mortality during a period of severe drought had disrupted many groups, new groups formed through the amalgamation of individuals and coalitions of relatives. In these White-winged Chough groups of less closely related individuals, it was found that more than one male or more than one female bred in various forms of polygamy. Mating patterns among Apostlebirds are probably similar to those of White-winged Choughs.

With both species, there are occasional records of clutches consisting of 7–8 eggs, rather than the usual 3–5 eggs, suggesting that more than one female lays eggs in the group's single nest. In Rowley's study of White-winged Choughs, it was estimated that about 15% of clutches were the result of contributions by two females.

Information on the breeding seasons of the Struthideidae is derived largely from observations made in temperate regions. The details from such areas indicate that egg-laying occurs in the austral spring and early summer, mainly from September to December, the struthideids having a capacity to nest also after unseasonal rains at other times, especially in drier areas. Among more northerly populations, laying may begin as early as July. If the first nest fails for any reason, White-winged Choughs will lay a replacement clutch, and some larger groups may nest again later in the season, in December, after having successfully reared one brood. In the study of Apostlebirds by I. A. Woxvold in central New South Wales, it was found that most groups attempted two broods.

White-winged Choughs usually build their nests on horizontal, often forked branches of tall trees, mainly eucalypts, at heights ranging from 2·4 m to 20 m, with a mean of about 10 m. Apostlebirds, too, prefer horizontal branches, generally in eucalypts, casuarinas (*Casuarina*) or acacia trees, but they nest lower down than White-winged Choughs, 3–12 m above the ground, the average nest height being about 8 m. Most of the nests of both species that have been found have been sited not far from a source of mud.

The constructing of the mud nest is not a quick process, and the two species use similar, characteristic methods. All group-members join in the work, although yearlings are conspicuously inept. The nest has to be built in several stages: first, a saddle is fastened to the chosen branch and allowed to dry; a platform is then built on this; and subsequently, from that platform, the walls of the bowl are raised in several sessions of work. During this final stage, both White-winged Choughs and Apostlebirds gather a piece of fibre or grass stem of suitable length, 4–6 cm, and take this to a source of mud, where they "dabble" it until it is liberally impregnated. The builder then flies, carrying this load, to the nest, places the material on the rim, and uses the bill to "trowel" it into position. Once the load is firmly settled, the bird places its bill sideways to the rim and opens and closes the mandibles rapidly, apparently achieving an effect similar to that of the vibrator of a



The brief display that leads to copulation in the ***White-winged Chough*** *may be initiated by either sex. The bird fluffs its feathers, fans its wings and tail, and shivers its body. It may crouch, or lower its head. Its partner may repeat this display one or more times after which the male, still displaying, mounts and copulates, an act which lasts about two seconds. In the courtship display of the Apostlebird* (Struthidea cinerea), *one or both birds pick up food or a twig, and the two walk side by side, with feathers raised, quivering their bodies. Before copulation, the male spreads his wings and tail so that they touch the ground, and produces a hoarse whispering with the bill open. The female responds with a similar display, and the two stand and beat their wings rapidly for about a minute.*

[*Corcorax melanoramphos melanoramphos*, Lara, Victoria, Australia. Photo: Peter Fuller]

concrete worker. A building session may last for an hour, but in this time the birds seldom raise the rim by more than 2 cm; this is because wet mud is unstable until it dries and hardens, which requires at least 24 hours depending on the weather conditions at the time. Completion of a new nest therefore takes several days, and can even take longer than the life of conveniently sited puddles. Even individual birds less than one year old, which can never before have seen a nest being built, attempt to assist; although they may try to carry mud to the nest, more often they accompany others and watch the proceedings. Once, a yearling White-winged Chough, in its excitement, caused the collapse of the new wall of a nest by inadvertently treading on it before the mud had set hard. Individuals in their second year build as keenly and as competently as adults.

Nest-building tends to be an opportunistic event following suitable rainfall, and the several stages may be interspersed with intervals of several weeks of inactivity. Building is not confined to the breeding season, although more is done then. Nests are frequently reused, but, since branches having a smooth bark are usually selected, old nests can become unstable as a result of the periodic bark-shedding action of the tree.

Breeding displays of the Struthideidae are rarely seen and little known, but they appear not to be elaborate. Either the male or the female White-winged Chough may initiate a brief display which leads to copulation. The bird fluffs its feathers, fans its wings and tail, or swings the tail from side to side, and shivers its body, and it may crouch or lower its head. The partner may repeat this display one or more times before the male, still displaying, copulates briefly, the last-mentioned action lasting for about two seconds.

During the nest-building period, Apostlebirds which are on the ground and collecting mud sometimes perform an excited display similar to the Wing-wave Tail-wag display of White-winged Choughs (see General Habits). A "Quivering" display by this species appears to function as a courtship and pre-copulatory display, usually initiated by the male. One or both sexes pick up food or a twig, and the two birds walk side by side, with feathers raised, while quivering the body. This display may be only brief, but after a longer parallel walk the two participants may fly to a tree and then fly out from it in a circular movements. Copulation by Apostlebirds is preceded by an intensive stationary Quivering display, during which the wings and tail are spread and touch the ground, while the bill is held open and a hoarse whispering sound is heard. A receptive female responds with a similar display, and the two then stand and beat their wings rapidly for about one minute, before the male mounts and copulates quickly.

The standard clutch of both species consists of three to five oval eggs. These are laid on successive days, and are incubated for 19–20 days by all members of the group. As already noted, there are occasional instances of more than one female laying in the one nest, resulting in an extra large clutch of up to ten eggs, with eggs laid at intervals of less than one day. White-winged Chough eggs are 40 × 30 mm in size, and have a creamy-white ground colour with a few dark brown and blackish blotches on top of grey or lavender ones. Apostlebird eggs are smaller, 30 × 22 mm, and are bluish-white with a few blotches of brown, grey and lavender. Although all the eggs in extra-large clutches sometimes hatch, only rarely do more than four chicks survive to leave the nest. Nestlings tend to hatch asynchronously, and they are brooded and fed by all group-members.

Young White-winged Choughs leave the nest 24–30 days after hatching and young Apostlebirds 18–20 days after the hatch, in both cases before they are capable of flying. They flutter down to the ground, where they are able to run and seek cover; they are completely dependent on the other group-members to feed them for at least four weeks after they have left the nest. Fledgling White-winged Choughs then slowly attain independence over the next 6–7 months, as they gradually learn to forage for themselves. They do not, however, reach sexual maturity and adult body weight until 4–5 years of age. The studies by Heinsohn and others suggest that this is partly because of the long time that they take in learning to forage efficiently. In the first four years of life, young birds that work hard at incubation and brood-feeding at the nest lose weight over this period, whereas adults do not. Juvenile White-winged Choughs do not disperse from the natal group but, instead, remain there until they reach sexual maturity and beyond, assisting with breeding attempts but not themselves breeding. They stay in the group as helpers until a breeding position becomes available, or until some catastrophic event leads to group disintegration and re-formation. Apostlebird fledglings are fed by other group-members for at least ten weeks. As with White-winged Choughs, they do not disperse from their natal group but remain as helpers, even after they reach sexual maturity, which probably occurs at two years of age.

For White-winged Choughs, the main cause of nest failure is chick starvation, particularly among small groups. Many chicks



*Nests of the **White-winged Chough** are built on horizontal branches of tall trees, at heights of 2·4–20 m. All group members join in the work. First, a saddle is fastened to the branch and allowed to dry. A platform is built on the saddle, and finally, the walls of the bowl-shaped nest are raised on the platform. During this final stage, a bird carries a piece of fibre or grass stem to a muddy patch, where it "dabbles" it until it is liberally impregnated. The builder then flies back to the nest, places the material on the rim, and uses the bill to "trowel" it into position. Construction is done in sessions over several days, or longer if the sources of mud dry up.*

[*Corcorax melanoramphos melanoramphos*, Carnarvon National Park, Queensland, Australia. Photo: Raoul Slater/ Lochman Transparencies]



Co-operative breeding in ***Apostlebirds*** *involves one breeding pair, and up to 17 helpers. Yearling helpers can be conspicuously inept at nest-building, but by their second year, immature birds build as keenly and competently as their parents. Clutches are usually of 3–5 eggs, laid on successive days. Occasional larger clutches are the product of more than one female. Although all the eggs in large clutches may hatch, only rarely do more than four chicks survive to leave the nest. All group-members incubate the eggs, although most work is done by the primary female. Eggs hatch asynchronously after 19–20 days.*

[*Struthidea cinerea cinerea*, Cunnamulla, Queensland, Australia. Photo: David Stowe]

die at nests from which one or more nestlings fledge, and there are data to indicate that heavier nestlings receive the most food, suggesting that, when food is scarce, adults feed the most viable young. Some nests or eggs are destroyed by neighbouring White-winged Chough groups, and nests are occasionally dislodged by strong winds. A major nest predator is the Pied Currawong (*Strepera graculina*), and other recorded predators are the Australian Raven (*Corvus coronoides*), the Australian Magpie, and a large monitor lizard known as the lace goanna (*Varanus varius*). Brood parasitism of White-winged Choughs by the Channel-billed Cuckoo (*Scythrops novaehollandiae*) has been recorded, but it was not found during two long-term studies carried out near Canberra, in Australian Capital Territory.

Starvation is a significant cause of mortality also of nestling Apostlebirds, about 23% of broods losing at least one nestling, usually the smallest of the brood. Nest predators and brood parasitism of Apostlebirds are not well known; raven and crow species (*Corvus*), the Grey Butcherbird (*Cracticus torquatus*) and



The nestling period of the ***White-winged Chough*** *is 24–30 days. The chicks are brooded and fed by all members of the group. However, most care of the young is offered by the older group-members, as individuals in their first four years are less efficient foragers, and usually struggle to feed themselves. Breeding success is linked to group size: large groups are the most productive; most nest failures involve smaller groups, and are due to the starvation of nestlings. There are indications that when food is scarce, adults feed the heaviest, most viable young.*

[*Corcorax melanoramphos melanoramphos*, Bugaldie, near Coonabarabran, New South Wales, Australia. Photo: W. R. Taylor/Ardea]

the Australasian Goshawk (*Accipiter fasciatus*) are recorded as predators of this species.

In Rowley's studies of White-winged Choughs near Canberra, 65% of nests produced at least one fledgling, but over 67% of nestlings died in the nest, giving an average of 1·1 fledglings per nest. Similarly, in the studies by Heinsohn and others in Canberra, 77% of nests fledged at least one young, but nearly 50% of chicks did not fledge. Nesting success increases with group size; in none of the studies of White-winged Choughs has a successful nest attended by only two birds been recorded, and groups of three individuals are seldom successful. Among groups of 4–8 individuals, however, about 75% of nests produce fledged young, and almost all nests of larger groups succeed. Most groups of more than four individuals that fail at their first nesting attempt of the season succeed at the second attempt, so that most groups containing more than three individuals produce at least one fledgling per year. As already mentioned, a group of White-winged Choughs will occasionally renest after having successfully raised a first brood; these tend to be large groups, and some of the members take over the care of the young while the others start on the second clutch.

In Woxvold's study of Apostlebirds, about 80% of nests succeeded in producing at least one young, with an average of 2·6 fledglings per nest. More broods were initiated than was the case with White-winged Choughs, and over the course of the breeding season groups produced an average of 4·2 fledglings, of which about 62% survived to the next breeding season. Only one group consisting of just two individuals attempted to breed, but it was unsuccessful, and groups of three did not produce more than one fledgling. As with the White-winged Chough, productivity of Apostlebirds increases with group size, the greatest improvement occurring over the range of 3–5 individuals.

For both White-winged Choughs and Apostlebirds, the importance of a large group for improved nest success lies in its capacity to provide adequate food for nestlings and more effective defence of nests. In large groups, the amount of help increases with the age of the helper, and all adults contribute more or less equally. In smaller groups, young helpers work harder. Nestlings within larger groups are fed at a higher rate, and large groups are also much more successful at defending the nest against intruders, whether these are other White-winged Chough groups or predators. Moreover, young birds in larger groups survive better in their first month after fledging, and in addition have a better rate of survival to one year and beyond. The main mortality occurs in the first year of life, and the first winter is a particularly difficult time, only about 50% of fledgling White-winged Choughs and 62% of Apostlebirds surviving to reach one year of age. The survival of adults is high. Many of the adult White-winged Choughs in Rowley's study were present throughout the seven years of the study, those that were adult at the start reaching at least 12 years of age. In Woxvold's study of Apostlebirds, the annual survival rate of adults was approximately 85%.

The two members of Struthideidae appear to be among the few bird species that are obligate co-operative breeders, as pairs on their own appear unable to rear any young. Members of White-winged Chough and Apostlebird groups other than the breeding pair are very much involved at most stages of the reproductive cycle, including the brooding and feeding of nestlings and the tending of fledglings. Heinsohn has suggested that, ultimately, it is the birds' foraging style which has shaped their social behaviour. Foraging is a slowly learnt skill, and food is collected slowly over a large area (see Food and Feeding), so that the breeding pair, in order to succeed in rearing young, needs the assistance that the helpers provide. Even the task of nurturing fledglings to sexual maturity requires the help and protection provided by the group. Because there is so little dispersal, helpers are usually assisting in the rearing of close relatives of themselves; even though the helpers are not rearing their own offspring, they are at least deriving an indirect benefit from helping to rear close kin. The destruction of nests belonging to nearby White-winged Chough groups that are not large enough to repel intruders is regarded as a way of reducing competition for food close to the intruders' own nest, and the kidnapping of fledglings from one group by another (see General Habits) increases the kidnappers' group size to levels at which reproductive success is almost assured.

Movements

White-winged Choughs and Apostlebirds are sedentary, and the Atlas of Australian Birds project shows no evidence of broad-



If they avoid starvation, nest predators, and attacks by other groups of conspecifics, young ***White-winged Choughs*** *and Apostlebirds* (Struthidea cinerea) *leave the nest before they are capable of flying. They flutter down to the ground, where they are able to run and seek cover. They remain completely dependent on group-members to feed them for at least a month; indeed, fledgling Apostlebirds are fed by group-members for at least ten weeks. Young White-winged Choughs gradually attain independence over the following six to seven months. Young birds in larger groups survive better in their first month after leaving the nest, and have a better rate of survival to one year and beyond.*

[*Corcorax melanoramphos melanoramphos*, Stanthorpe, Queensland, Australia.
Photo: Graeme Chapman]



Only about 62% of ***Apostlebirds*** *survive to reach one year of age, and the first winter is a particularly difficult time. Young birds take a long time to learn their foraging skills, which goes some way to explaining their co-operative breeding habits. The young stay in the group as helpers until a breeding position becomes available, or until the group disintegrates. The survival rate for adults is high, at 85% for Apostlebirds, while many White-winged Choughs* (Corcorax melanoramphos) *reach at least twelve years of age.*

[*Struthidea cinerea cinerea*, Murray-Sunset National Park, Victoria, Australia. Photo: Peter Fuller]

scale movement by either species. The co-operative breeding groups occupy stable territories during the breeding season, and do not move outside them until their fledglings are able to travel with the group. The group then moves over a much larger home range, of up to 1000 ha in the case of White-winged Choughs and at least 100 ha for Apostlebirds.

Movements in the non-breeding season may involve a shift in habitat for the White-winged Chough, from open forest into pasture and cereal stubble. Non-breeding birds may form large aggregations at an abundant source of food, but the group structure is retained. At the start of the next breeding season, the groups usually return to the same breeding territories that they had occupied in the previous year. Apostlebird groups sometimes form large assemblies close to permanent water or good feeding habitat, such as cereal stubble. At the edge of their range in arid and semi-arid areas, and when seasonal conditions are favourable, these movements of Apostlebirds outside the breeding season can lead to a gradual extension of the species' range.

Relationship with Man

Despite widespread clearing of their preferred habitats, both White-winged Choughs and Apostlebirds have adapted to the changes and now co-exist successfully with human habitation. White-winged Choughs were once considered a pest in wheat crops, where they were said to pull up shooting grain, but the large scale of current wheat farms has eliminated this problem. In rural areas, both species are attracted to food and water sources around farm and station homesteads, such as stockyards and fowlyards, and to picnic areas in national parks or at the roadside. Here, both species can become very tame, and groups will approach a picnic party of people in expectation of food scraps.

In the more densely inhabited agricultural areas closer to the east coast, White-winged Choughs have adapted to life in the parks and gardens of country towns. A population resident in the Botanic Gardens in Canberra, Australia's capital city, has been the subject of a long-running study by Heinsohn and others.

Status and Conservation

Neither of the species of Struthideidae is globally threatened. Nor are they included among the species listed as "Threatened" by the Australian Environmental Protection and Biodiversity Conservation Act of 1999. Both species occur over a wide area and, although a significant part of their ranges has been cleared for agriculture, enough suitable habitat remains, both within and outside reserves, for the two species to be considered secure overall. Nevertheless, some local populations have suffered significant decline.

The South Australian subspecies *whiteae* of the White-winged Chough has a restricted range on the Eyre Peninsula, and is considered "Rare" by the South Australian Department of Environment and Heritage, largely on account of habitat loss. The other subspecies, the nominate race, has a much larger range, within which it often found in plantations of exotic pines, in timbered farmland, and in parks and large gardens with trees in suburban areas.

The Apostlebird is listed as "Threatened" in Victoria. A population which lived in south-west Victoria and adjacent south-east South Australia has become extinct, but Apostlebirds still occur in a very limited area in the north and north-west of Victoria, where much of their preferred eucalypt woodland habitat near the Murray River has been cleared for agriculture. A survey of historical records by I. A. W. McAllan and R. O'Brien, however, suggests that these latter birds are more recent arrivals, the result of range expansion of the New South Wales population. The range of the Apostlebird, while contracting in some areas owing to habitat loss, is expanding farther westwards in New South Wales and into South Australia, and the species is spreading to the east and west of the northern parts of its range in Queensland.

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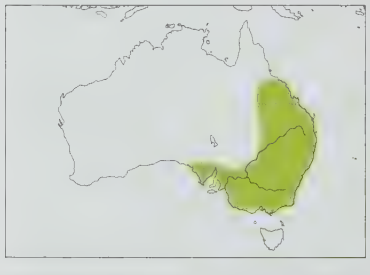
Genus *CORCORAX* Lesson, 1831

1. White-winged Chough

Corcorax melanoramphos

French: Corbicrave leucoptère **German**: Drosselkrähe **Spanish**: Corvino Negro
Other common names: Apostle-bird(!), Black Jay/Magpie

Taxonomy. *Coracia melanoramphos* Vieillot, 1817, New South Wales, Australia.
Family treatment much disputed over the years, and present species has variously been placed in Corvidae, Grallinidae or a monospecific Corcoracidae; close relationship with *Struthidea* generally agreed. Geographical variation minimal, and species formerly treated as monotypic. Races intergrade in SE South Australia (in and just E of Mt Lofty Ranges). Proposed race *subniger* (from Ringwood, in Victoria) synonymized with nominate. Species name often misspelt "*melanorhamphos*". Two subspecies currently recognized.
Subspecies and Distribution.
C. m. melanoramphos (Vieillot, 1817) – E Australia from E half of Queensland (S from region of Clarke Range) S to New South Wales (except NW), Victoria (mainly N of Great Dividing Range) and SE South Australia (Mt Lofty Ranges).
C. m. whiteae Mathews, 1912 – S & SE South Australia (Eyre Peninsula and Mt Lofty Ranges).



Descriptive notes. 44–50 cm; 280–425 g. Nominate race has plumage entirely black, except for white wingpanel (c. 8 cm; visible only in flight) across most of primaries; some greenish gloss on new head feathers; old plumage with brownish tinge; iris red to orange, sclerotic ring sometimes engorded, turning bright red, in moments of excitement or aggression; bill and legs dark grey to blackish. Distinguished from superficially similar ravens and crows (*Corvus*) by long, slender downcurved bill, long tail, relatively small head, white in wing, red (not white or black) eye colour. Sexes similar. Juvenile differs from adult only in having brown eyes; eye colour changes with age, acquiring more orange over four years, and as in adult in fifth year. Race *whiteae* is very similar in appearance to nominate but smaller, with slightly shorter and thinner bill, perhaps also with faint pinkish wash in wingpanel. Voice. Clear piping whistle, usually descending in pitch and ventriloquial; also a variety of harsher calls.
Habitat. Open habitats, mainly eucalypt (*Eucalyptus*) woodlands and open forests in which canopy is not closed; found also in plantations of exotic pines (*Pinus*), in well-wooded farmland and in suburban areas with well-established parks and large gardens. Prefers sparse understorey with grass and few shrubs, and a thick layer of leaf litter, fallen bark and twigs. Also forages out over stubble of harvested crops.
Food and Feeding. Wide range of seeds and insects; insects predominate in summer, and seeds in winter. Also occasionally small mammals and bivalve molluscs. Forages mainly on ground, where it digs with the bill, turning over and raking through litter. Once, during a plague of house mice (*Mus musculus*), both this species and *Struthidea cinerea* seen to chase mice from under grass tussocks, grab them by the neck, and beat the victims against ground before consuming them. Has been recorded also as probing in mud of a creekbed for freshwater mussels (of family Hyriidae), which it prised open with the bill or smashed against a rock. Forages in groups, members of which 1–2 m apart in a line; very few prey items in their path are overlooked. Young do not become skilled in all methods of food-finding for at least two years.
Breeding. Laying in Sept–Dec (in austral spring and early summer), but can breed after rain at other times in drier areas; sometimes two broods. Co-operative breeder in group consisting of generally one breeding pair and up to 18 helpers, latter largely offspring of main pair. Nest, built by all group-members, a large bowl constructed of mud, placed 2·4–20 m (mostly 8–10 m) above ground on horizontal branch or fork of tree, most commonly a eucalypt; built slowly, as each layer of mud has to dry before next layer added. Clutch usually 3–5 eggs, larger clutches the product of more than one female; incubation by all group-members, period 19–20 days; chicks brooded and fed by all members of group, nestling period 24–30 days; fledglings cared for by non-breeding helpers, allowing female to renest, most care of young by older group-members as individuals in first four years are less efficient foragers and struggle to feed themselves; young do not become independent until 6–7 months, and remain with group in subsequent years as helpers. Large groups most productive; most nest failures involve smaller groups, and due to starvation of nestlings; pairs without helpers always unsuccessful.
Movements. Sedentary, wandering over large home range of c. 1000 ha in non-breeding season, with stable territory in breeding season. Does not disperse from natal group unless a vacancy for a breeding male or female occurs in a nearby group.
Status and Conservation. Not globally threatened. Widespread, but never common; South Australian race *whiteae* rare. Rather sparsely distributed, as groups require large home range and, further, species has suffered from habitat clearance for agriculture. Main threats, in addition to habitat loss, are fire and also disruption of breeding by drought and increasing aridity, which prevent the building of mud nests. In addition to wildfires, man-made "fuel-reduction burns" remove understorey vegetation and the ground litter on which this species depends. Can co-exist with man in well-wooded farmland, in pine plantations and on fringes of country towns or suburban areas with extensive parks. Occurs in many national parks and other protected areas.
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Genus *STRUTHIDEA* Gould, 1837

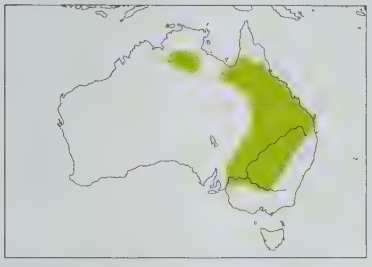
2. Apostlebird

Struthidea cinerea

French: Apôtre gris **German**: Gimpelhäher **Spanish**: Corvino Apóstol

Taxonomy. *Struthidea cinerea* Gould, 1837, interior of New South Wales, Australia.
Family treatment much disputed over the years, and present species has frequently been placed in Grallinidae or a monospecific Struthideidae; close relationship with *Corcorax* generally agreed. Races intergrade in NC Queensland. Isolated population in Northern Territory formerly thought to represent a distinct race from that in N Queensland, but now considered identical. Although name *swainsoni* predates *dalyi*, former regarded as invalid, as description and measurements of type specimen ambiguous and possibly based on intermediate specimen, and type locality (N Queensland) imprecise and could lie within zone of intergradation with nominate. Two subspecies recognized.

Subspecies and Distribution.
S. c. dalyi Mathews, 1923 – N Northern Territory (mainly S of Roper R) and N & NC Queensland, in N Australia.
S. c. cinerea Gould, 1837 – C & S Queensland, inland New South Wales, N Victoria (along Murray R) and E South Australia (mainly N of Murray R).



Descriptive notes. 29–33 cm; 110–155 g. Distinctive, with rather pointed feathers on head and neck giving shaggy appearance, and long dark tail; short, deep bill similar to that of a finch (Fringillidae). Nominate race has head and body grey, feathers with dark shaft streaks and paler edges, lores and ear-coverts blackish, breast paler grey; wing brown, tail black with greenish gloss; iris greyish with thin pearly outer ring, iris becomes reddish-brown in excitement; bill and legs blackish. Sexes similar. Juvenile is similar to adult, but feathers of head and body softer, with looser texture, and streaking less marked, iris brown. Race *dalyi* is slightly larger than nominate, has larger bill, is darker and more streaked above and paler grey ventrally. Voice. Very vocal. Range of generally harsh, scolding or squeaky calls, including "kreech" as a threat or warning, also "chee-ow" given to intruders or in territorial disputes and also in play-chases by juveniles.
Habitat. Open habitats, especially arid and semi-arid woodlands, or shrublands with scattered trees. Bold and tame around modified habitat: farms, camping and picnic grounds and country cemeteries.
Food and Feeding. Diet chiefly seeds and insects; also takes eggs from nests of other birds, and small mammals taken occasionally. Forages on the ground, and occasionally in low vegetation. Feeds on insects flushed from ground or from vegetation; also rakes through litter, and scratches with the bill around grasses or shrubs; extracts seeds from cones of native cypress-pine (*Callitris*), and takes insects from beneath bark. Uses bill to hammer at hard insects or seeds. Once, during a plague of house mice (*Mus musculus*), both this species and *Corcorax melanoramphos* seen to chase mice from under grass tussocks, grab them by the neck, and beat the victims against ground before consuming them. Forages as a group; in non-breeding season, aggregations of up to 100 individuals may form at water or where food is abundant.
Breeding. Laying in Aug–Feb (in austral spring–summer), but may breed in response to rain at other times in drier areas; often two broods. Co-operative breeder in group consisting of generally one breeding pair and up to 17 helpers, latter largely offspring of main pair. Nest, built by all group-members, a bowl of dried mud, reinforced with grass and twigs, placed 3–12 m (mostly 6–8 m) above ground on horizontal branch or fork of tree, especially casuarina (*Casuarina*) or eucalypt (*Eucalyptus*), and often acacia (*Acacia*); grass or twigs taken to source of mud, dipped in mud until coated, and then carried to nest, also mud alone added; nest built in stages, allowed to dry before new layer of material added. Clutch usually 3–5 eggs, occasional larger clutches the product of more than one female; incubation by all group-members, most of work done by primary female, incubation period 19–20 days; chicks fed by all members of group, nestling period 18–20 days; fledglings fed by group-members for c. 10 weeks; juveniles remain with group as helpers in later years. High proportion of nests successful, but many (especially those of smaller groups) suffer partial brood loss through starvation.
Movements. Sedentary; group territorial in breeding season, at other times wanders over larger home range (to up to 1 km from breeding territory). Does not disperse from natal group unless to fill vacancy for breeder (male or female) in nearby group.
Status and Conservation. Not globally threatened. Widespread, and locally fairly common. Range had expanded to N; decline in E & SE, where clearance for agriculture has destroyed woodland habitat. Main threats, in addition to habitat loss, are fire and the disruption of breeding by drought and increasing aridity, which prevent the building of mud nests. As well as wildfires, man-made "fuel-reduction burns" remove understorey vegetation and the ground litter on which the species depends. Able to co-exist with humans in well-wooded farmland and on fringes of country towns. Occurs in many national parks and other protected areas.

Bibliography. Amadon (1950), Anon. (1926), Baldwin (1975), Barker & Vestjens (1990), Barrett *et al.* (2003), Blakers *et al.* (1984), Bourke (1941), Chapman (1998), Gould (1837), Higgins *et al.* (2006), Hobbs (1976), Johnson *et al.* (2003), Mayr (1963), McAllan & O'Brien (2001), Parker (1984), Ramsay (1883a), Rowley (1978b), Schodde & Mason (1999), Seth-Smith (1911), Shufeldt (1923), Sibley & Ahlquist (1985a, 1990), Sibley & Monroe (1990), Whitmore (1981), Woxvold (2004), Woxvold & Magrath (2004, 2005, 2008), Woxvold & Mulder (2008), Woxvold, Adcock & Mulder (2006), Woxvold, Mulder & Magrath (2006).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family ARTAMIDAE (WOODSWALLOWS)



- Small, fast-flying insectivorous passerines with long pointed wings, short tail and blue-grey bill; plumage mainly grey, brown, black and white.
- 12–21 cm.



- South and east Oriental Region, Australasia and south-west Pacific.
- Open forest and woodland, savanna and grassland.
- 1 genus, 11 species, 25 taxa.
- No species threatened; none extinct since 1600.

Systematics

Woodswallows form a very uniform family, with only one genus, *Artamus*, generally accepted. The first recorded specimen was brought from Manila, in the Philippines, to Paris, France, by M. Poivre, and was described by Linnaeus in 1771, in his *Mantissa Plantarum*, as a shrike, "*Lanius leucoryn*[*chus*]"; this specimen has since been lost. In 1801, J. Latham described a *Turdus sordidus* and a *Loxia cyanoptera* from Sydney, Australia, but these were, in fact, one and the same species, now known as the Dusky Woodswallow (*Artamus cyanopterus*). In 1816, L. J. P. Vieillot first used *Artamus* as a generic name for woodswallows; the word derives from the Greek *artamos*, meaning a butcher or a murderer, and, as the birds were still thought to be shrikes, the alternative English name was "swallow-shrike". The German common name, *Schwalbenstar*, which means literally "swallow-starling", refers to the pointed shape of the wing in flight, which resembles that of the Common Starling (*Sturnus vulgaris*).

The Artamidae were recognized as a monogeneric family in all classifications until the mid-1980s, when C. G. Sibley and J. E. Ahlquist undertook studies of DNA–DNA hybridization. These authors inferred, from analyses of their results, that the woodswallows fell within their greatly expanded family Corvidae, and their closest relatives seemed to be the Australian currawongs (*Strepera*), butcherbirds (*Cracticus*), previously grouped in the family Cracticidae or the family Streperidae. The Sibley and Ahlquist classification included the woodswallows, the currawongs, the Australian Magpie (*Cracticus tibicen*) and the butcherbirds in the tribe Artamini within the Corvidae. Subsequent taxonomic usage within Australia has been to recognize a family Artamidae that includes the members of the Artamini. R. Schodde and I. J. Mason showed that, apart from genetic similarity, the woodswallows share many distinctive features of skull morphology with *Strepera* and *Cracticus*.

Much of the nineteenth century was a time of taxonomic confusion, created to a large extent by collectors who referred their new material to museums or private collections in different parts of Europe. Communication was difficult and slow, as a consequence of which it was rare for similar species to be directly compared. Several different genera of woodswallows were created: *Artamus*, by Vieillot in April 1816, *Angroyan*, by J. K. W. Illiger in December 1816, *Leptopteryx*, by J. G. Wagler in 1827, *Ocypterus*, by R. Lesson in 1830, and *Cataphania*, by J. Gistel in 1848. These genera were used until R. B. Sharpe regularized the nomenclature in 1890, creating the family Artamidae with a single genus, *Artamus*.

In 1912, G. M. Mathews, at the height of his "splitting" frenzy, introduced a further four genera. These were *Campbellornis*, for the Masked Woodswallow (*Artamus personatus*) and the White-browed Woodswallow (*Artamus superciliosus*), *Austrartamus*, for the Black-faced Woodswallow (*Artamus cinereus*), *Pseudartamus*, for the Dusky Woodswallow, and *Micrartamus*, for the Little Woodswallow (*Artamus minor*). Two years later, Mathews resurrected Illiger's genus, replacing *Pseudartamus* with



Woodswallows form a very uniform family, with only one genus, Artamus, *generally accepted. All eleven species have a squat silhouette, a short tail and long pointed wings, short legs, a broad-based, conical bill, and a brush-like tongue. In nine species, the sexes are similar. The plumage is generally bicoloured, in combinations of white, brown, grey and black. In some species, like the* ***Ashy Woodswallow****, the contrast between darker head and wings and lighter underparts is relatively muted; in others, the contrast is much bolder. Throughout its range, which extends from the Indian Subcontinent eastwards to south-east China and South-east Asia, the Ashy Woodswallow is the only representative of the family.*

[*Artamus fuscus*, Tamil Nadu, India. Photo: Hanne & Jens Eriksen]

Angroyan, and subsequently describing a taxon as *Angroyan cyanopterus perthi*, but all of these innovations failed to find general acceptance. E. Stresemann, in 1913, reviewed the subspecies of the White-breasted Woodswallow (*Artamus leucorynchus*) and drew up a useful key for their separation. Four-and-a-half decades later, A. Keast reviewed the variation and movements of the six Australian woodswallows, commenting that the most mobile species exhibited little regional variation and that the sedentary Black-faced Woodswallow was the most variable. E. Mayr, who contributed the section on Artamidae in J. L. Peters's *Checklist of Birds of the World*, in 1962, listed ten species, of which five, namely the Ashy Woodswallow (*Artamus fuscus*), the Great Woodswallow (*Artamus maximus*), the White-backed Woodswallow (*Artamus insignis*), and the Masked and White-browed Woodswallows, currently remain as monotypic species; the Ivory-backed Woodswallow (*Artamus monachus*) was treated as a monotypic species by C. M. N. White and M. D. Bruce, in 1986, and the Little Woodswallow was considered by Schodde and Mason to consist of two subspecies. S. Eck disagreed with Mayr's listing of the Ivory-backed Woodswallow and the White-backed Woodswallow as separate species. He regarded the latter as being an allopatric subspecies of the Ivory-backed Woodswallow, despite the fact that the two have geographically discrete ranges between which the Great Woodswallow occurs. Eck also regarded the Fiji Woodswallow (*Artamus mentalis*) as a separate species, a treatment followed by H. E. Wolters, by Sibley and B. L. Monroe, and by D. Watling. The Fiji Woodswallow has often been treated as a subspecies of the White-breasted Woodswallow, but it differs from that in possessing a duskier back and crown, a characteristic throat pattern, a more extensively white rump, and white tips on the wing and tail.

In a thorough review of the family, published in 1977, R. D. Étchécopar and F. Hüe agreed with Mayr's listing, except that they regarded the subspecies *celebensis* of the White-breasted Woodswallow as synonymous with the race *albiventer*, as did White and Bruce in 1986. Most of the nine forms of the White-breasted Woodswallow are allopatric island populations that show a reluctance to fly across expanses of open water; until comprehensive DNA analyses are performed, decisions on the systematic status of these populations cannot be made with any degree of confidence. Although Linnaeus, in his original description, wrote the name of the species as "*leucoryn*", this truncated spelling has virtually never been used throughout the ornithological history of this taxon. The spelling "*leucorynchus*" has been widely used and now becomes the valid version on the basis of prevailing usage, as laid down by the International Code of Zoological Nomenclature.

Less widespread, the four subspecies of the Black-faced Woodswallow listed by Mayr in 1962 have undergone considerable taxonomic readjustment. A few years after Mayr's list was published, very thorough research by G. F. Mees indicated that, contrary to Vieillot's statement in 1817, the type specimen of the Black-faced Woodswallow did not come from Timor. When describing and naming *Artamus cinereus*, Vieillot had drawn his details from the 1807 catalogue of the dealer C. J. Temminck, giving Timor as the type locality. When the type specimen was finally located, in the Rijksmuseum van Natuurlijke Historie, in the Netherlands, it was clearly of the Australian race, having the two central rectrices black-tipped, whereas birds of this species from Timor, now known as the subspecies *perspicillatus*, have all rectrices tipped white. The type specimen had been mounted, and the label mentioned Australia and "N.S.Wales". The story did not end there, however, and in 1978 J. Ford pointed out that the Black-faced Woodswallow is an inland species in eastern Australia, that exploration west of the Great Dividing Range did not take place until 1813, and that the specimen could not therefore have been collected in what is now New South Wales in 1807 as Mees had claimed. In 1982, after further searching, Mees reported that Stresemann had shown, three decades earlier, that Temminck's specimen bore the collector's number 166 in the Temminck catalogue, which indicated that it had been collected by J. Labillardière not later than 1799. This further excludes New South Wales as the type location, as Labillardière visited only Tasmania and south-western Australia. The only place from where he could have collected the specimen is the mainland opposite the Archipelago of the Recherche, in extreme south Western Australia, in December 1792. This has been confirmed by material collected more recently, as Mees pointed out.

In 1999, Schodde and Mason regularized the nomenclature for the Black-faced Woodswallow. They separated those with a



*The **Ivory-backed Woodswallow** shows a strong contrast between its mostly white body and its brownish-grey head and throat, and blackish-grey wings and tail. The absence of sexual dimorphism, in both plumage and measurements, has severely limited behavioural observations of woodswallows. It has been suggested that the White-backed Woodswallow* (Artamus insignis)*, which has similarly contrasting plumage, white with sooty black head, throat, wings and tail, is a subspecies of the Ivory-backed Woodswallow. However, the two species are widely separated geographically, with the Great Woodswallow* (A. maximus) *occurring in between.*

[*Artamus monachus*, Lore Lindu National Park, Sulawesi. Photo: Pete Morris]



*The **White-browed Woodswallow** is one of only two woodswallow species in which the sexes have different plumage. The other is Masked Woodswallow* (Artamus personatus), *with which the White-browed often associates in its nomadic movements, both species being found in the more open habitats of mainland Australia. The male White-browed stands out among the generally dull-plumaged members of the genus, with its bright rufous or chestnut underparts. The female has the same basic plumage pattern as the male, but is noticeably paler and duller, and with a much less conspicuous eyebrow. Immature White-browed Woodswallows are similar in plumage to the females, but with some streaking and pale mottling. The juvenile plumage of the monomorphic species is not unlike that of the adults, though browner above, and having pale tips or fringes to the feathers. The blue grey bill with a black tip, clearly visible in this picture, is common to all eleven species. As a result of their main foraging technique, woodswallows require a perch from which they can view their surrounds and launch themselves in pursuit of prey. This means that they frequently perch conspicuously on dead trees, and on telephone and power lines. White-browed Woodswallows are found in inland shrubland, as well as open woodland and adjacent farmland; also in parks, and occasionally in built-up areas.*

[*Artamus superciliosus*, Hattah-Kulkyne National Park, Victoria, Australia. Photo: Dean Ingwersen]



Woodswallows fly fast in pursuit of prey, but they also soar and glide extensively. Their flight is characterized by short glides interspersed with rapid wingbeats, and is superficially similar to that of the Common Starling (Sturnus vulgaris). *Nine subspecies of* ***White-breasted Woodswallow*** *are currently recognized. Most are island populations, which appear reluctant to fly across expanses of open water. They vary in the coloration of the head and upperparts, and also in overall size, bill size and wing length. The race* leucopygialis, *shown here, occurs in northern and eastern Australia, as well as the Moluccas, New Guinea and the Aru Islands.*

[*Artamus leucorynchus leucopygialis*, Broome, Western Australia, Australia. Photo: Rohan Clarke]

white vent, the subspecies *normani* and *dealbatus*, from those with a black vent, the nominate race and *melanops*, leaving *perspicillatus*, with its completely white-tipped set of rectrices, as the representative of this species in Timor.

In 1982, Wolters suggested that the genus *Artamus* could be split into three subgenera. These, although not employed taxonomically in the present treatment, do nevertheless provide a convenient subdivision of the family. The first of the three subgenera is *Artamus*, incorporating six species: the Ashy, White-breasted, Ivory-backed, Great, White-backed and Fiji Woodswallows. These six are sexually monomorphic in plumage, which is bicoloured in white and slate, brown or black, with a white rump; the tail is stubby and usually plain-tipped. The second is *Campbellornis*, containing the Masked and White-browed Woodswallows: these two are sexually dimorphic in plumage, and have a plain rump and a slender and white-tipped tail. The third and last subgenus, *Angroyan*, with the Black-faced, Dusky and Little Woodswallows, is again characterized by the possession of sexually monomorphic plumage, which is plain, light to dusky grey-brown, with a plain rump and a contrastingly white-tipped tail.

Morphological Aspects

The eleven species of woodswallow share several characteristic features. They all have a squat silhouette, a short tail, long pointed wings with a vestigial tenth primary, a conical broad-based blue-grey bill with a black tip, short legs and a brush-like tongue, and all have a soft-textured plumage with constantly growing powder-downs. Schodde and Mason demonstrated that they share certain features of skull morphology, especially that of the palate, with butcherbirds, the Australian Magpie and currawongs, all of which are currently placed in the family Cracticidae (see Systematics).

Woodswallows are rather dull-plumaged birds, especially when compared with many other passerines occurring in the same regions. Their main colours are black, brown, grey and white. One species, the White-browed Woodswallow, adds a touch of rufous in the plumage, having the underside of the body, from the lower breast to the vent, chestnut to light rufous in colour. Tracts of continuously growing powder-down feathers are unusual among passerines, and are found only in the woodswallows and the cotingas (Cotingidae). The purpose of these is obscure, but they are presumed to serve in feather maintenance. Originally commented on by C. L. Nitzsch in 1867, these unusual feather tracts were not noticed by other workers for more than a century, until M. H. Clench redescribed them in 1985.

Nine of the eleven woodswallow species are monomorphic, both in plumage and in measurements. This has severely limited most behavioural observations, since mating, when the roles of the sexes are obvious, is a brief affair and the partners are usually indistinguishable from each other once they have separated. Even with studies of colour-ringed individuals it is rare for the human observer to be able to identify the sex of the woodswallows involved, and the male and the female appear to participate equally in most parental duties. Copulation and the act of egg-laying, however, are rarely witnessed. The Masked and White-browed Woodswallows are the only members of the family which are sexually dimorphic in plumage. With each of these two, the female has the same basic plumage pattern as that of the male of the species, but she is noticeably paler and duller.

Juvenile plumage is gene5rally not at all unlike that of the adult, differing primarily in being browner above, and having pale fringes or tips of the feathers. As an example, the juvenile Ashy Woodswallow, compared with its respective adult, has a browner head and upperparts, with buff feather fringes on the mantle, upperwing-coverts and remiges; in addition, it has a paler, more buffish-grey throat and underparts with brownish vermiculations. The immatures of the Masked and White-browed Woodswallows, the two sexually dimorphic species, are similar in plumage to their respective females, but with some streaking and/or pale mottling.

Little is known about the moult of woodswallow species outside Australia. In the latter country, adults have a complete post-breeding moult, from November to May. From the limited information available, the primaries are moulted outwards and the secondaries inwards, and this probably applies to all members of the family. The nestlings are covered with down at hatching or soon thereafter, and they leave the nest in juvenile plumage. After a few months, they undergo a partial body moult and acquire an adult-like plumage; when they are about one year old, they have a complete moult into the adult plumage. In subsequent years, there is a complete post-breeding moult each year,



Woodswallows appear to be extremely sociable when at rest or roosting. They typically forage alone, but in the intervals between feeding, the birds tend to gather on a convenient branch, as these ***White-browed Woodswallows*** *are doing. This species often gathers in large numbers at dusk, and sometimes forms large clusters during the day, when they may mingle with congeners, especially Masked* (Artamus personatus) *and Black-faced Woodswallows* (A. cinereus). *Both White-browed and Masked Woodswallows appear to camp in dense foliage, and are so sensitive to intruders that there seem to be no detailed observations of their nocturnal roosting behaviour. The variable movements of these species may prevent them from gathering regularly at particular sites. White-browed Woodswallows live predominantly in the eastern half of Australia, and their annual movement is described as an "inland circle": the birds move north in the winter, and return southwards by a more inland route, which may take them into Western Australia. They travel in flocks of up to 200 individuals, often mixed with Masked Woodswallows. The proportion of the White-browed species in the mixed flocks increases towards the east; the White-browed is also found further to the south than the Masked. In the western half of Australia, the Masked Woodswallow tends to form single-species flocks of up to 1000 birds. In the breeding season, the sudden arrival of a flock of White-browed Woodswallows may be followed by the rapid establishment of a breeding colony, but these irruptions do not occur regularly at the same places.*

[*Artamus superciliosus*, Thylungra Station, Queensland, Australia. Photo: Graeme Chapman]



*Tightly packed along a branch or telephone line, roosting **White-breasted Woodswallows** have been described as "looking like black and white pegs on a clothes line". The birds will struggle with one another in order not to be left at the ends of the rows. Woodswallows move along a perch by shuffling sideways, moving one foot after the other. The long, strong claws, clearly visible in this picture, can anchor them securely to the trunk of a tree throughout the night, when sheltering from a storm. The strong grip of the claws also enables them to retreat stealthily to the underside or far side of a branch to avoid being seen by a predator. But they are usually aggressive towards predators, and will chase away much larger birds from the vicinity of their nests.*

[*Artamus leucorynchus leucopygialis*, Northern Territory, Australia. Photo: Günter Ziesler]

with no change in appearance. Geographical variation in the timing of the moult is little known. In arid regions where breeding is irregular, moult can take place over an extended period, and K. Immelmann observed simultaneous moult and breeding by Black-faced Woodswallows.

Habitat

The preferred habitat of woodswallows includes savanna woodland, although these species are found also in more open forest throughout the south-west of Australia and the forest of the wet tropics of the north-east, as well as in other parts of the family's geographical range.

Being aerial insectivores, woodswallows require a perch from which they can view their surrounds and launch themselves in pursuit of prey. This means that they frequently perch conspicuously in such places as dead trees and on telephone and power lines, and they are rarely found in extensive open cultivation, although they may soar and trawl for insects over treeless habitats.

Typically, woodswallows are inhabitants of open wooded country, shrublands, open woodland and adjacent farmlands. They occur in areas of cultivation so long as suitable perches are available for them at sufficient densities and not too widely scattered. The White-breasted Woodswallow, for example, is common in open country, cultivation and light woodland, and this species can also be found in mangroves; it is often observed near habitation, and it frequently attends herds of cattle or water buffalo (*Bubalus*). The Little Woodswallow is widespread in Australia, where it is found in scrublands, on rocky hills and cliffs, and around the low scarp tops and coloured outcrops known as "breakaways".

In New Guinea, the Great Woodswallow is more a species of forest, in which it is found mainly in clearings and in garden areas with dead trees, occasionally appearing in tall emergent trees above the canopy of primary forest. This species is found above 800 m, but most members of the family seem to prefer the lowlands. Nevertheless, the White-breasted Woodswallow is occasionally observed in forest clearings at elevations of up to 1500 m.

General Habits

Woodswallows are aerial hunters and fly fast in pursuit of prey, but they also soar and glide extensively and appear to enjoy extreme sociability at rest or when roosting, frequently preening both themselves and each other.

Mayr, in 1945, rated *Artamus* species as the best fliers among the oscine passerines. The flight of woodswallows is characterized by short glides interspersed with rapid wingbeats, and is superficially similar to the flight of the Common Starling. They fly fast and with great agility when hunting close to the ground or when high up, but if the wind is very strong they make only brief sorties from convenient low perches, such as from fencelines or from isolated weeds left standing in stubbles. On the ground, woodswallows hop with both feet together and appear clumsy, since the short tarsi are placed to the rear of the body. They usually perch on exposed branches, from which they can easily launch themselves and make aerial sorties. If they need to move along a branch, they shuffle sideways by moving one foot after the other. Long strong claws enable them to cling to the trunk of a tree all night when roosting, to shelter from a rainstorm, or to retreat stealthily to the underside or the rear surface of a branch to avoid being seen by an approaching raptor or other predator. Although brave in defence of its nest, a solitary woodswallow perched on an exposed branch, if it does become aware of the approach of a raptor, may slip sideways, keeping the branch between itself and the predator, and quickly changing sides after the latter has passed. This behaviour is possible because of the woodswallow's short tarsi and strong claws. It may well be unique among passerines, as it is employed as a means of avoiding being seen in what would otherwise be a very exposed position and where flight may be even more dangerous.

Small birds rivalling the true swallows (Hirundinidae) in their aerial skills, woodswallows are one of the few groups whose members sometimes soar on thermals and frequently glide for



Little Woodswallows *are associated mainly with cliffs and rocky outcrops, where they will pack themselves into holes or clefts when resting and roosting. The two other plain, mostly brown species, the Black-faced* (Artamus cinereus) *and Dusky Woodswallows* (A. cyanopterus), *also tend to roost in scrum-like clusters. The birds gather about 20 minutes before sunset, and fly around the site before settling. The roost-site may also be a hollow stump, a scar left by a fallen branch, or the stick nest of a larger bird. Roosts tend to be used for several nights in succession, with alternative sites used if the birds are disturbed or the wind changes. These species are very sensitive to disturbance, and will "explode" from the roost when approached.*

[*Artamus minor minor*, Mileura Station, Western Australia, Australia. Photo: Graeme Chapman]

several minutes. Their aerial competence was well described in 1967 by E. T. Gilliard, who watched the Great Woodswallows high in the Adelbert Mountains of northern New Guinea:

> "Woodswallows may fly up and away from the perch, but they usually dive from it. They simply step off and fall nearly straight down for 10 feet [3 m], then open the wings and level out in a long graceful swoop, nor do they then flap the wings but usually continue to soar in fast graceful arcs. They flutter the wings in short bursts, often when it seems unnecessary as in the following case: a bird dove from a perch and then soared out over the valley. Out of curiosity, I counted slowly (averaging a second to a number) and watched for the first sign of wing motion. I counted to 135 before the first flapping took place and then the bird, which had mounted ever higher in the sky, fluttered steeply upwards for some unknown reason, certainly not to just gain altitude. Probably an insect was sighted. But the woodswallows generally soar and flutter going down and through the dead trunks and out into the valley in long static soars, gliding like a child's paper airplane, then breaking into flurries of wing motion, only to glide again. In landing they usually come in low and dive up to the perch, but some come directly at it and then back paddle with the wings."

Woodswallows display two very different tendencies in their interactions with other birds. On the one hand, they are very aggressive towards predators, particularly when these are anywhere near their nests, and, on the other, they are compulsively social in their resting and roosting habits. A good example of artamid aggression was recorded by S. Garnett and G. Crowley during their study of the globally threatened Golden-shouldered Parrot (*Psephotus chrysopterygius*). These authors found that the young parrots, as well as several other bird species, regularly foraged in the vicinity of active Black-faced Woodswallow nests, with the advantage that any approaching would-be predator, such as a butcherbird or a kookaburra (*Dacelo*), was "chivvied and chased until it changed its mind".

During intervals between foraging, which is a solitary exercise for most woodswallows, the birds tend to gather on a convenient branch, where they preen themselves and each other. When it comes to roosting, this sociality reaches an extreme. White-breasted Woodswallows, for instance, form a compact line along a branch or a telephone wire, even in the middle of some cities, at which time they battle with one another in an effort to avoid being left at the end of the line, with "the usual unavailing struggling to squeeze back into the pack"; in these situations they often sleep snugly in rows right under the light, "looking like black and white pegs on a clothes line".



The social behaviour of woodswallows includes preening in the intervals between foraging excursions, as shown by these ***White-breasted Woodswallows****. Individuals, as well as themselves, will also preen each other. All woodswallows have constantly growing powder-down feathers, a feature that is unusual among passerines, and otherwise found only in the cotingas (Cotingidae). The function of powder-downs is not altogether clear, but the fine powder they yield probably plays a part in feather maintenance.*

[*Artamus leucorynchus melaleucus*, New Caledonia. Photo: Roland Seitre]



Wing-stretching may occur as part of the suite of activities associated with feather maintenance, or simply the easing of tired muscles. While stretching its wing, this ***Dusky Woodswallow*** *is displaying one of the plumage differences between the nominate race, found on the south-eastern side of Australia, and race* perthi, *found in the south-west. The nominate race has white streaks on the outer 2–4 long primaries, while* perthi *has less white, restricted to the outer 2–3 long primaries. These races are weakly differentiated, and intergrade in South Australia.*

[*Artamus cyanopterus cyanopterus*, Glen Davis, New South Wales, Australia. Photo: Drew Fulton]

Neither Masked Woodswallows nor White-browed Woodswallows have been found to roost at night side by side or clumped together. Perhaps the rather nomadic, footloose movements made by these species preclude the luxury of regular, well-known sites, and their nesting colonies are usually unpredictable surprises. They appear to camp in dense foliage, and they are so sensitive to intruders that there seem to be no detailed observations of their nocturnal roosting behaviour. White-browed Woodswallows often gather in large numbers at dusk, and sometimes form large clusters during the day, when they may mingle with congeners, especially Masked and Black-faced Woodswallows.

The three plain brown, more sedentary species, the Black-faced, Dusky and Little Woodswallows, tend each to roost in a dense cluster, reminiscent in appearance of a rugby scrum. These aggregations follow a set routine, the birds gathering about 20 minutes before sunset and indulging in brief flights around the site before settling. Suddenly, a sharp call is given and the group flies off to the roost-site, which may be a scar on a tree trunk where a limb has fallen, a hollow tree stump, or perhaps the interior of a stick nest of an Australasian babbler (*Pomatostomus*) or raven (*Corvus*). These sites tend to be used for several nights in succession, but a group usually has several potential places to go to if disturbed or if the wind conditions change. These species are very sensitive to inspection when roosting, "exploding" from the site when approached by a human observer.

The strength of the urge to roost together was exemplified in a study of colour-ringed Dusky Woodswallows. In this instance, the four attendants at a nest deserted their 12-day old, well-feathered nestlings, leaving them unguarded all night while they joined a roosting cluster of the species more than 100 m away. The brood survived, and five days later all of the young fledged, and joined the adults in their cluster-roost.

Daytime roosting in a cluster, which tends to occur in response to cold, windy weather, is a much easier phenomenon to observe. The woodswallows tend each to grasp the substrate with their feet, usually with the head pointed upwards. As many as 200 Dusky Woodswallows have been seen to remain clustered for several hours on the leeward side of a forest tree. It has been frequently suggested that these birds cluster in this manner in order to preserve body heat, but this hardly explains why the behaviour persists through hot summers. The only way which would seem likely to provide an answer would be to measure the temperature in these scrums, but nobody has yet managed to do this.



Head flung back as though in full song, this ***Great Woodswallow*** *is actually sunbathing! The sun's rays can be used to help condition feathers that may be slightly out of shape. In fact, woodswallow song is seldom heard. Delivered from a high perch, it consists of a prolonged soft jumble of notes, including imitations of other birds, and is similar to the songs of New World mockingbirds (Mimidae). More often heard is the chattering "kakakaka..." given by groups of perched Great Woodswallows.*

[*Artamus maximus*, Tari Valley, New Guinea. Photo: Brian J. Coates]

Voice

For the White-breasted Woodswallow, B. E. Smythies, in *The Birds of Borneo*, quoted from J. Whitehead's published field notes,



Woodswallows will often consume small items while still in flight, but they normally carry larger items, either in the bill or in the feet, back to a favourite perch. ***White-breasted Woodswallows*** *typically harvest their prey in flight above the treetops. They will also take advantage of insects disturbed by tractors or large animals, and they frequently attend herds of cattle or water buffaloes. Although woodswallows occasionally forage singly or in twos or threes, they are generally found in small to large groups when hunting. They often associate with other species, such as swallows (Hirundinidae) and swifts (Apodidae). This species is a vagrant to Japan.*

[*Artamus leucorynchus*,
Hatto-cho, Shimane-ken,
Japan.
Photo: Hirozo Maki]

made in the last decades of the nineteenth century. "Their note is a ceaseless disagreeable sharp chatter… . They are most disagreeable little birds; they sit in families of four or five, huddled close together on the bare branches of some dead tree, and attack every other species that [comes] near the spot."

Very often, the first inkling that woodswallows are nearby is the characteristic brief contact calling as the birds soar high overhead. They may be a travelling flock or foraging local residents. Most descriptions of woodswallows refer to this vocalization as a loud, brisk chirping "peet-peet", "tseet-tseet" or "chek-chek". Woodswallows call also as they approach to feed a brood of nestlings or to communicate with an incubating individual. When perched together in a row or spread through the branches of a dead tree, they keep up a ceaseless chirping chatter. A softer call is sometimes given by an individual sitting alone, apparently "talking to itself", but perhaps keeping contact with other group-members not far away. This is probably the "soft twittering song" referred to in many accounts and field guides, and which may incorporate contact and other calls, as well as an element of mimicry. On the basis of his extensive studies of New Guinea birds, J. M. Diamond stated that the song of the Great Woodswallow was delivered from a perch in the crown of a tall tree, and was rarely heard. He described it as being a prolonged soft jumble of notes, including imitations of other birds, and thought it very similar to the songs of New World mockingbirds (Mimidae); song elements include squawks, chirps and short trills, each repeated up to five times.

Immelmann commented on the differences in the frequency with which vocalizations were delivered. Black-faced Woodswallows accompany almost every movement with calls, whereas White-breasted Woodswallows give voice much less frequently, and a group of Little Woodswallows may often utter no sounds at all for periods of several minutes.

During a total of 55 hours spent in a hide established 3 m from a nest of Black-faced Woodswallows, the observers identified several different types of vocalization. These were the following: contact calls exchanged between conspecifics; greeting calls uttered by group-members at an active nest; calls emitted by hungry nestlings; and loud calls given by an individual on guard duty at a nest, these varying from mild alert to intense alarm. When the intruder posed a real threat, as was the case with, for example, a raven, a raptor or an approaching human, fox (*Vulpes*) or reptile, the members of the group uttered harsh calls as they swooped, mobbing the intruder, and occasionally making physical contact.

Greeting calls were given by the incubating or brooding woodswallow as soon as it sighted an individual that was approaching in order to relieve it. These loud repeated "qua" notes became more and more excited, especially if the arriving bird had food to



Woodswallows will seize large beetles (Coleoptera) or larvae from foliage, or pounce on them on the ground. During prolonged windy spells, when winged insects are not flying, they may feed on the ground for more extended periods, consuming large ants (Formicidae). When locusts (Acrididae) are present in plague numbers, the ***Black-faced Woodswallow*** *becomes a specialist predator, coincidentally performing a valuable service for farmers. The birds snap the locusts up as they jump, and may even hover in anticipation. Woodswallows eat a number of other potential "pest" species, including cockroaches (Blattodea), termites (Isoptera), and moths and their caterpillars (Lepidoptera).*

[*Artamus cinereus melanops*,
Windorah, Queensland,
Australia.
Photo: Graeme Chapman]



The large insects which ***Great Woodswallows*** *capture on the wing are brought back to the perch to be dismembered. Woodswallows use their feet to clamp the prey against the branch, while tearing it to pieces with the beak. Food for nestlings is often prepared in this way. Although sociable at other times, the Great Woodswallow tends to be a solitary hunter. Living in New Guinea, it is more a species of forest than of extensive open habitats, the normal habitat of the family. Found mainly in clearings and in garden areas with dead trees, it occasionally appears in tall emergent trees above the canopy of primary forest.*

[*Artamus maximus*, Ambua Lodge, EC New Guinea. Photo: Jon Hornbuckle]

offer, in which case the sitter began vigorous wing-fluttering. Frequently, such series incorporated a distinctive rattle consisting of a rapid series of progressively louder short syllables. The rattle was generally followed by a series of loud "qua" sounds.

Nestling woodswallows, as they grow, become more and more vocal in expectation of food, but they quieten abruptly when an alarm is given. A series of graded, loud, short alarm calls is given by adults when potential danger is identified near an active nest; these range from mild alert to the louder calls that accompany the active mobbing of an intruder. A brief call similar to the low-level alarm chatter is given just before the group moves to its final roosting spot for the night.

Food and Feeding

With their strong bill and their aerial agility, woodswallows are able to take in a wide variety of prey, ranging from flies (Diptera) to moths (Lepidoptera), beetles (Coleoptera) and grasshoppers (Orthoptera). They will often consume small items while still in flight, but they normally carry larger items, either in the bill or in the feet, back to a favourite perch, where they swallow the food. If the item is too large or too tough to be swallowed whole, the woodswallow will use its feet to clamp the food against the branch and tear it to pieces. Food destined to be fed to nestlings is often prepared in this way.

Much of the foraging carried out by resident members of this family involves hunting from a lookout post. The woodswallow sits quietly on a perch providing a clear view, and from there launches itself into the air to pursue prey, returning to the perch to eat it. Woodswallows catch much of their food in the air, but also catch items on the ground or other substrate. They will seize large beetles or larvae from foliage or pounce on them on the ground. When the opportunity presents itself, they will "follow the plough" in agricultural areas, seizing larvae and insects as these are uncovered by the digging blades. During plagues of grasshoppers they hunt the insects in a most "professional" manner, snapping them up as they jump, and sometimes even hovering in anticipation. Strong winds preclude a lot of insect activity and renders aerial feeding by woodswallows unprofitable, if not impossible. During prolonged windy spells, the birds sometimes feed on the ground and consume large ants (Formicidae).

The brush-like tongue of the Artamidae enables the members of this family to take advantage of the "honey-flow", the nectar, produced by flowering trees such as eucalypts (*Eucalyptus*) or the silky oak (*Grevillea robusta*). This food source is particularly important for two migrants which spend the winter in tropical northern Australia, the Masked and the White-browed Woodswallows, species that are labile enough in their movements to exploit blossom bonanzas. Although attracted to the nectar, woodswallows certainly relish the additional fare provided by



Woodswallows have a brush-like tongue, similar to those of nectar specialists like honeyeaters (Meliphagidae) and lorikeets (Loriinae). This enables them to vary their diet to take advantage of the seasonal food produced by flowering trees such as Eucalyptus. *As well as feeding on nectar, this* ***Black-faced Woodswallow*** *may also be taking insects that are attracted to the blossom. Nectar is a particularly important food for Masked Woodswallows* (Artamus personatus) *and White-browed Woodswallows* (A. superciliosus), *which spend the winter in tropical Northern Australia, when insect availability drops in the south.*

[*Artamus cinereus melanops*, Winton, Queensland, Australia. Photo: Graeme Chapman]



*This mixed flock of **White-browed** and **Masked Woodswallows** has stopped to drink during the circular inland journey of these species. Their movements in the northern regions are irregular, probably being dependent on the amount of rainfall during the preceding summer. Rainfall, and the consequent abundance of insects and blossom, has a direct influence on the timing of breeding in most species of woodswallow. Black-faced Woodswallows* (Artamus cinereus) *have been observed to begin courtship within minutes of rain starting.*

[*Artamus superciliosus* and *A. personatus*, Cobar, New South Wales, Australia.
Photo: Andy & Gill Swash/ WorldWildlifeImages.com]

the insects and other arthropods that swarm at the blossoms and the pollen of the flowers and elsewhere. Centipedes (Chilopoda), dragonflies (Odonata), cockroaches (Blattodea), termites (Isoptera), grasshoppers and crickets (Orthoptera), cicadas (Cicadoidea), beetles, moths, caterpillars, wasps and bees (Hymenoptera), ants, scorpions (Scorpiones) and spiders (Araneae) have all been recorded in their diet. Woodswallows have been recorded also as consuming a variety of plant seeds, including those of the genera *Xanthorrhoea*, *Enchylaena*, *Rhagodia*, *Melaleuca* and *Grevillea*.

Although woodswallows occasionally forage singly or in twos or threes, they are generally found in small to large groups when hunting (see also General Habits). They tend to make aerial forays individually. Most artamids associate with other species, at least on occasion, especially when at abundant food sources. In several parts of the family's range they will forage in the air with hirundinids or swifts (Apodidae), and they will at times join other birds such as honeyeaters (Meliphagidae) and bee-eaters (Meropidae).

Breeding

Although the nest-sites and eggs of all Australian species of woodswallow have been described, little more is known about the breeding biology of most artamids, especially those that do not breed in Australia. All of those species for which the relevant details are available build a flat cup-nest of thin twigs, placed in a twiggy fork or crotch of a tree, and lay a comparatively small clutch of 2–4 eggs. Two species, the Dusky and Black-faced Woodswallows, have been the subject of more detailed study, and what is known of other members of the family suggests that the breeding habits of these are similar in many respects to those of the two studied species.

Those species that are relatively well known usually breed as resident pairs or small groups, maintaining territories against conspecifics. The resident species maintain their pair-bonds throughout the winter months. At least six of the eleven species of *Artamus* have been recorded as sometimes breeding co-operatively, whereby members of a group other than the parents help to defend a nest and feed the brood, but few long-term studies have been carried out to determine whether or not they are group-living throughout the year. The six are the White-breasted, Great, Fiji, Black-faced, Dusky and Little Woodswallows. In the case of the resident Black-faced Woodswallow, young ringed as nestlings were known to stay with the group for up to three years, and were helping to feed siblings, since the breeding pair remained the same. With the Dusky Woodswallow, co-operative breeding occurs even among populations which are not resident throughout the year. In no studies of other co-operatively breeding woodswallows has the origin of group-members been determined, nor has it been shown whether or not the individuals remain together as a group all year. Many of the reports of woodswallows in field guides refer to "small parties" or "groups of 3–10 individuals" and similar, but there is no evidence from studies of marked individuals that these are family parties.

In this family, co-operative breeding is characterized by the presence of breeding and non-breeding mature individuals in a social group. The non-breeders, usually termed "helpers", assist in the defence of the nest and in attacking predators or cuckoos (Cuculidae). In particular, they contribute to the reproductive efforts of the senior breeding pair by feeding the nestlings and caring for the young after these have left the nest. Although many groups of woodswallows contain more than a simple pair of adults, there has been no documented case of extra-pair or extra-group copulation and no indication that such phenomena may occur.

The timing of breeding by woodswallows varies considerably, being influenced mainly by latitude and the seasonal distribution of rainfall for particular populations. Australian woodswallows generally breed during the austral spring and early summer, although in arid regions they may breed at other times in response to rainfall. The widely distributed White-breasted Woodswallow breeds from August to February in Australia and New Guinea, and tends to nest from April to June in Indonesia; in the Philippines, its breeding season begins in March and April. The widespread Black-faced Woodswallow breeds in Western Australia from August to January in the tropical north with high summer rainfall; farther south, in the arid regions north

Little is known about the breeding biology of most woodswallows, especially those that do not breed in Australia. Two species that have been studied in more detail are the ***Black-faced Woodswallow*** *and the Dusky Woodswallow* (Artamus cyanopterus). *Copulation is preceded by an elaborate courtship display, which may be initiated by either partner. One bird partly opens its wings, and begins to wave them in time with the rotation of its spread tail, about ten times in 15 seconds. The second bird joins in, and the birds display to one another for a minute or more, until they appear to have achieved synchrony. The male then flies to the female, and the act of copulation takes place rapidly, lasting no more than five seconds.*



[*Artamus cinereus melanops*, Lake Bindegolly National Park, Queensland, Australia. Photo: Chris Tzaros]

and south of the Tropic of Capricorn, it breeds from July to October, and occasionally from December to April if heavy cyclonic rains pass through the region in summer. In the southern winter-rainfall region, breeding by this species occurs from September to early January in the wetter south-west and from July to September in the drier southern interior. In central Australia, Immelmann observed the response of Black-faced Woodswallows to heavy rain in early May, after a dry period of several months, in Alice Springs. He saw courtship several minutes after the beginning of the rain, and the first copulations occurred about two hours later. The woodswallows began to pick up nesting material while rain was still falling, and the first nest was completed six days and the first eggs laid twelve days after the rain had started. The better-known Australian species may make a second nesting attempt if the first nest fails, and sometimes if it is successful. In the only studies of known individuals hitherto undertaken, however, there were no successful second broods in a season.

Breeding by Ashy Woodswallows in the Indian Subcontinent varies locally, from March to June in some regions and from January to July in others, depending on the rainy season. This species breeds in March–June in South-east Asia. The timing of breeding of the White-backed, Great and Ivory-backed Woodswallows is little known, but information on the reproduction habits of other birds in the New Guinea region suggests that most breeding occurs before or after the peak of the wet season.

Copulation is a brief affair, lasting not longer than five seconds, and is preceded by an elaborate and beautiful display, which I. C. R. Rowley described for the Dusky Woodswallow. Either the male or the female may initiate the display when the two birds are 5–10 m apart, often in different trees. One individual partly opens its wings and begins to wave them in time with the rotation of the spread tail, about ten times in 15 seconds. The partner very soon joins in with an identical display, which may last for more than a minute until the pair appears to have achieved synchrony. The male then flies to the female and briefly mounts her. Similar displays have been observed to be performed by the Black-faced, White-browed, White-breasted and Little Woodswallows. Immelmann noted that woodswallows do not utter any vocalizations during copulation.

All of the woodswallow species build an open cup-shaped nest. The work is shared by both members of a pair, each in turn bringing a single twig or piece of grass. The outer framework of the cup is of thin twigs in a relatively loose construction, which is then usually lined with fine grass and rootlets. Most nests are placed conspicuously in a twiggy fork or crotch of a tree or shrub, but woodswallows may also use man-made structures, such as the tops of fence posts, telephone poles, electricity pylons and

Although pairs may nest solitarily, ***Masked Woodswallows*** *also form loose breeding colonies of ten or more pairs, with nests 10 m apart. In the east of their range, they are often found in mixed colonies with White-browed Woodswallow* (Artamus superciliosus). *Once a flock settles at a site, nests are built rapidly, within a week. The work is shared, each partner bringing a twig or piece of grass in turn. But not all woodswallows tolerate the proximity of their conspecifics when breeding. Despite their sociability in most other activities, Dusky Woodswallows* (A. cyanopterus) *defend an area with a radius of 50 m around the nest.*



[*Artamus personatus*, Hattah-Kulkyne National Park, Victoria, Australia. Photo: Dean Ingwersen]



All woodswallow species for which nesting information is available build a loose, cup-shaped nest of thin twigs, lined with finer materials such as grass and rootlets. The ***White-browed Woodswallow*** *nests relatively low down, in a forked branch, in a hollow stump, or behind creepers or bark. Other species favour higher positions; the nest of the Great Woodswallow* (Artamus maximus)*, for example, is usually more than 15 m up in a dead tree. In Australia,* Artamus *nests are generally placed 1–10 m above the ground. Occasionally woodswallows will pick man-made structures such as utility poles and fence posts. Clutch size, where known, ranges from two to five eggs, most frequently three or four. All species lay similar eggs, with a creamy-white ground colour, spotted with grey or red-brown. Larger species lay larger eggs. Incubation takes around 14 days in the Black-faced* (A. cinereus) *and Dusky Woodswallows* (A. cyanopterus)*; the range for the White-browed Woodswallow is 12–16 days, with a mean of 13 days. Incubation is undertaken by both parents, and in at least some species, also by helpers. At least six of the eleven species of woodswallow have been recorded as sometimes breeding co-operatively, with non-breeding adults, perhaps the young of previous years, helping with the care and feeding of the young birds, and with defence against predators. In one group of resident Black-faced Woodswallows, birds ringed as nestlings stayed with the group for up to three years, and were helping to feed their own siblings, since the breeding pair remained the same. But in no studies of other co-operatively breeding woodswallows has the origin of group members been determined, nor has it been shown whether the individuals remain together as a group all year.*

[*Artamus superciliosus*, Bollon, Queensland, Australia.
Photo: Raoul Slater]



*In the **Dusky Woodswallow**, co-operative breeding occurs even among populations that are not resident throughout the year. In southern New South Wales, where the species is migratory, an immature ringed as a nestling helped at a nest of its father one year later. At first, the nestlings are brooded almost continuously, mostly by the breeding pair, but with short periods of brooding by the helpers. The breeding female takes the major share in incubation and brooding, but more than half of the feeding visits can be made by the helpers, and the frequency increases as the growing nestlings become more demanding.*

[*Artamus cyanopterus cyanopterus*, Chiltern–Mt Pilot National Park, Victoria, Australia. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]

buildings. Many species will also occasionally make use of tree spouts or the lips of hollow stumps. Little Woodswallows, which frequently live near rocky cliffs or steep hillsides, often nest on a small shallow ledge or cleft in a cliff, or in a hole in the face of a boulder. In Australia, *Artamus* nests are generally placed 1–10 m above the ground, and typically below 5 m, although higher nests have been reported for White-breasted Woodswallows. The comparatively low nest height for such aerial species reflects the low-growing vegetation of the arid and semi-arid areas which constitute a large part of their range in Australia. The nesting habits of the Great, Ivory-backed and White-backed Woodswallows are very inadequately known, but there is a report by Gilliard and M. LeCroy that nests of Great Woodswallows in the New Guinea mountains are sited at a relatively high level, above 13 m.

Because so few marked individuals have been studied, the spacing of nests is not well known. Rowley noted that Dusky Woodswallows, despite their sociability when flocking or roosting, defended a territory within a radius of about 50 m of the nest, from which they chased away any intruding conspecifics. The area around the nest defended by Black-faced Woodswallows is usually smaller, although Rowley noted that nests were no closer than 100 m in continuous vegetation. Colonial nesting has been described for the very mobile, nomadic Masked and White-browed Woodswallows, which sometimes nest in loose colonies of ten or more pairs; such colonies consist of either one of the two species or of both mixed together.

The eggs of all woodswallows for which information is available are very similar to one another. They have a creamy-white ground colour which is spotted with grey or red-brown in a zone at the blunter end. Eggs increase in size with the body size of the female; they range from 19·1 × 14 mm, as laid by the Little Woodswallow, to 23 × 17 mm, the size of those of the White-breasted and Dusky Woodswallows. The eggs of the largest members of the family, the Great and White-backed Woodswallows, have not been described. Clutches are small, and exhibit little variation with season or latitude. For most species, clutch size has been found to range from two eggs to four eggs, with three eggs the most frequent. For the Dusky Woodswallow near Canberra, in south-east Australia, Rowley found the mean clutch size to be 3·3 eggs, and for Black-faced Woodswallows in southern inland Western Australia the mean was 3·2 eggs. Eggs are laid in the morning, at one-day intervals. Incubation of the eggs is undertaken by both partners, and also by any helpers which the pair may have. In the case of the Black-faced Woodswallows studied by Rowley, incubation began with the laying of the second egg in a three-egg clutch and with the third egg in a four-egg clutch. Rowley found an incubation period of 14 days for the Black-faced Woodswallow and 14–15 days for the Dusky Woodswallow. At hatching, the nestlings are pink, with sparse down. They rapidly darken as the feather shafts begin to emerge. The chicks of these two species left the nest 18–19 days after hatching.

At a nest of Black-faced Woodswallows attended by a marked group of five individuals, including three helpers, the breeding pair and the helpers carried food to the nest and removed faecal sacs. At first, the nestlings were brooded almost continuously, mostly by the breeding pair but with short periods of brooding by the helpers, the latter accounting for about one third of the brooding time. Once the chicks were well feathered, brooding was not necessary, but when the nest was exposed to sun, during very hot weather, the attendants that fed the nestlings, after having delivered food, usually remained at the open nest and shaded it with their wings. The presumed breeding female was most active in incubation and brooding, but more than half of the feeding visits were made by the helpers; feeding rates increased as the nestlings aged. All of the group took part in nest defence. A similar role was taken by helpers in feeding the young of Dusky Woodswallows, and it seems probable that the behaviour is much the same among the other artamid species which are described as breeding co-operatively, namely the Little, Great and White-breasted Woodswallows. The young left the nest together, and stayed nearby for a day or two. Fledglings can fly only weakly



*In the **Masked Woodswallow**, the chicks are brooded and fed by both parents, with no helpers involved. The nestling period is 12–13 days, occasionally longer, and the fledglings are attended by the parents for at least 12 days. In the White-browed Woodswallow* (Artamus superciliosus), *with which the Masked frequently flocks and nests colonially, the nestling period is 13–16 days, and fledglings continue to be fed by the parents for at least a further three weeks after leaving the nest. Both species breed opportunistically and irregularly, and lack an attachment to specific places. They are prone to abandoning breeding colonies suddenly, probably because of food shortages.*

[*Artamus personatus*, Lake Cronin Nature Reserve, Western Australia, Australia. Photo: Jiri Lochman/ Lochman Transparencies]

when they leave the nest, and their flight-feathers continue to grow for a further week or so.

For most members of the family, the fate of the young after they leave the nest is not known, since there appear to be no relevant studies of marked individuals. As woodswallows are generally so sociable, roosting and flocking together (see General Habits), it is tempting to suppose that family-members stay together. Dusky Woodswallows in Australia were migratory at the localitity where Rowley studied them, in southern New South Wales, but they returned to the same nesting area each year; an immature, ringed as a nestling, helped at a nest of its father one year later. In a resident population of Black-faced Woodswallows, progeny stayed with their natal group for up to three years. One young male left his natal group and made a breeding attempt nearby, but, when that nest failed, he returned to help with brood-feeding at his parents' nest.

In the Dusky and Black-faced Woodswallows, only half of the nests succeeded in terms of producing fledged young, and groups of Black-faced Woodswallows produced a mean of 1·5 fledglings per year. No information is available on breeding success of other species in the family. In the case of the two better-studied woodswallows, the exposed fragile nests were susceptible to wind and storms, which unseated several and tipped out the eggs or nestlings. No nest predators were identified for either species, although woodswallows aggressively mobbed many potential nest predators, such as the Brown Falcon (*Falco berigora*), the Australian Kestrel (*Falco cenchroides*), the Laughing Kookaburra (*Dacelo novaeguineae*) and the Australian Raven (*Corvus coronoides*). M. G. Brooker and L. C. Brooker identified the Australian species of *Artamus* as biological hosts of the Pallid Cuckoo (*Cuculus pallidus*), and R. E. Johnstone and G. M. Storr recorded this cuckoo as an occasional parasite of Masked, Dusky, White-breasted and Black-faced Woodswallows. Rowley did not record brood parasitism as a cause of failure, although Black-faced Woodswallows were seen to chase Pallid Cuckoos aggressively.

Not surprisingly, in view of the fact that these are such little-known, mobile birds, there appears to be no available information on the survival or longevity of any of the eleven species.

Movements

So far as is known, the woodswallows living outside Australia are resident, with some seasonal local movement. All of the Australian species, however, are nomadic or migratory to some extent.

The Black-faced Woodswallow is most likely to be resident, although some of its populations appear to be locally nomadic. There seems to be some movement by this species towards the north coast in the dry season, when populations in such areas as the Kimberley region, in Western Australia, and near Darwin, in Northern Territory, are augmented by visitors from inland areas farther south. The Dusky Woodswallow lives predominantly in southern Australia. In the northern part of its range on the east coast it is sedentary, but southern populations, those in Tasmania and southern Victoria, move north in the austral winter, leaving southern New South Wales in late April, and do not return until September. Little Woodswallows are found mostly in the northern half of Australia, and, while the northern populations are probably resident, those living farther south move northwards in winter, into the region of the tropical dry season.

White-browed Woodswallows live predominantly in the eastern half of Australia, and their movement is described as an "inland circle". These birds move north in the winter, and return southwards by a more inland route which may take them into Western Australia. They migrate usually in large flocks, and often in company with Masked Woodswallows. In the breeding season, the sudden arrival of a flock may be followed by the rapid establishment of a breeding colony, but irruptions do not occur regularly at the same place. Masked and White-breasted Woodswallows in eastern Australia fly north-west in the winter. In Western Australia, the Masked Woodswallow shifts north from



All members of a co-operative breeding group, parents and helpers, take part in defending the nest. When the nest is exposed to the sun, parents and helpers may also stay behind after delivering food, and shade the young with their wings. But despite the contributions of helpers, fewer than half of the studied nests of ***Dusky Woodswallows*** *and Black-faced Woodswallows* (Artamus cinereus) *succeeded in producing fledged young, and groups of Black-faced produced a mean of just 1·5 fledglings per year. The problems begin with woodswallows' exposed, flimsy nests. Those of the Black-faced, for example, are often unlined, and so sparsely woven that the eggs are visible from below. Several of the nests in the study were unseated by winds and storms, tipping out the eggs or nestlings. No nest predators were identified, although the two studied species mobbed potential predators like falcons* (Falco), *kookaburras* (Dacelo) *and ravens* (Corvus) *aggressively. The Pallid Cuckoo* (Cuculus pallidus) *has been recorded as an occasional parasite of Masked* (A. personatus), *White-breasted* (A. leucorynchus), *Dusky and Black-faced Woodswallows. No information is available on the breeding success of other woodswallow species.*

[*Artamus cyanopterus cyanopterus*, near Penrith, Sydney, New South Wales, Australia. Photo: David Stowe]



*The chicks of **Black-faced Woodswallows** leave the nest 18–19 days after hatching. At first the fledglings can fly only weakly if at all, and their flight-feathers continue to grow for a further week or more. The fledglings continue to be attended and fed by the parents and helpers, for a period of at least twelve days in the Masked Woodswallow* (Artamus personatus)*, and 50 days or more in the White-breasted Woodswallow* (A. leucorynchus).

[*Artamus cinereus perspicillatus*, West Timor, Lesser Sundas. Photo: Morten Strange]

southern regions, but its movement in the northern regions is highly irregular, probably being dependent on the amount of rainfall during the preceding summer.

Underlying all these movements is the fact that aerial insectivores do not find cold southern winters very profitable, whereas the tropical savanna woodlands provide abundant insects and nectar after summer rain. The distribution of these summer rains is highly irregular, and is governed by the paths taken by tropical cyclones when they move inland. As a consequence, while woodswallow movements may be in a very general overall direction, these species are perhaps best considered as being more nomadic, with a northerly or southerly bias in their movements.

Relationship with Man

Woodswallows are not widely known birds in urban Australia, nor do they appear to have any special significance for people living in other parts of the family's range. Their main habitats in Australia are found inland and in northern regions, and they are



*Young **Little Woodswallows** leave the nest at around 16–20 days. They continue to be fed by both parents, and perhaps helpers too, although this is another species whose breeding biology is not well known. What happens to the young of most woodswallow species after fledging is similarly unknown, since there appear to be few relevant studies of marked individuals. Given the highly sociable nature of these species, families may stay together, and in a resident population of Black-faced Woodswallows* (Artamus cinereus)*, the progeny stayed with their natal group for up to three years.*

[*Artamus minor derbyi*, Cunnamulla, Queensland, Australia. Photo: David Stowe]

little known in the large southern coastal cities. In northern cities, they are more visible, making use of power lines, street lighting and other structures for foraging and for their pre-roost gatherings. Even there, however, their feeding habits do not bring them into city gardens.

Because they consume large quantities of insects, woodswallows could well be beneficial to humans. It is likely that, at least on occasion, they eat good numbers of insects which are considered by man to be pests. As an example, Black-faced Woodswallows in Australia are known to become specialist predators on locusts (Acrididae) at times when these orthopterans occur in plague proportions.

Status and Conservation

*None of the eleven species of woodswallow is listed as globally threatened, although some subspecies may be less secure, and some local populations have disappeared. The restricted-range **Fiji Woodswallow**, for example, is no longer found on many of the Fijian islands on which it was reported in 1920. But following the early loss of moist lowland forest and savanna which were possibly its original habitat, this species seems to have adapted well to human-altered habitats.*

[*Artamus mentalis*, Fiji. Photo: Jon Hornbuckle]

As they are aerial insectivores, woodswallows are not subject to the same pressures as those that affect understorey birds, for example loss of ground-level vegetation through overgrazing and burning. In consequence, none of the eleven species and 25 taxa in the family Artamidae is listed by BirdLife International under any category of threat.

In Australia, no species or subspecies of woodswallow has become extinct since the time of European settlement, in 1788. This conclusion is based on a review initiated by the Australian Government Department of the Environment (or Natural Heritage Fund), carried out by Garnett and Crowley and published in 2000. The only Australian artamid population that may be endangered is the Cape York Peninsula subspecies, *normani*, of the Black-faced Woodswallow, a race which occurs also in south New Guinea. This population has lost a lot of habitat owing to the increased burning of grasslands by pastoralists and the consequent shortage of suitable nest-sites in open savanna woodland. Careful fire management and the existence of national parks should help to ensure that its current status as a common species throughout Australia can be maintained.

The main risks facing species outside Australia are loss of habitat. This is a particular problem for those woodswallows that live in forest in Indonesia and on the Pacific islands, where this habitat is subject to clearance in many areas. Throughout its range, which extends from the Indian Subcontinent eastwards to south-east China and South-east Asia, the Ashy Woodswallow is the only representative of its family. Everywhere within its area of distribution it is fairly common to common but rather local, but it seems not to be at any immediate risk.

*The **White-breasted Woodswallow** is locally common throughout most of its range. The race* amydrus *has even colonized Peninsular Malaysia. However, the Palau endemic subspecies* pelewensis, *once probably found throughout the island group, is now confined to the upper savannas of the island of Babeldaob, and may number fewer than 100 birds; it therefore qualifies as threatened. Those species that depend on forest in Pacific and Indonesian islands may be at risk. The White-backed Woodswallow* (A. insignis) *lost 12% of its habitat on New Britain in the 1990s, and is now scarce or absent from much of its former range.*

[*Artamus leucorynchus pelewensis*, Ngardmau, Babeldaob, Palau Islands. Photo: Mandy Etpison]





Clearing of wooded habitat for agriculture in southern inland Australia has been largely beneficial for woodswallows. So long as sufficient trees are left for roosting, nesting and perching, this human activity has created new areas of suitable habitat for these birds. The replacement of old telegraph wires, strung between poles, by underground cables has made woodswallows less visible along many country roads, although fences, in places where they are present, may serve as perches if nothing else is available. In some of the savanna woodlands of Cape York Peninsula, in north Queensland, which are subject to grazing by cattle, the routine burning of grasslands has resulted in a large increase in the amount of closed scrubland in place of the open woodland favoured by Black-faced Woodswallows for nesting. In contrast, removal of timber from closed forests in south-east and south-west Australia has created open spaces, something that has suited Dusky Woodswallows for the purposes of nesting.

General Bibliography

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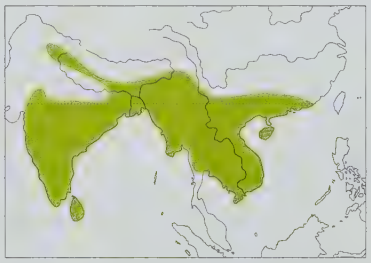
Genus *ARTAMUS* Vieillot, 1816

1. **Ashy Woodswallow**

Artamus fuscus

French: Langrayen brun **German**: Grauschwalbenstar **Spanish**: Artamo Ceniciento
Other common names: Ashy Swallow-shrike/Wood Swallow, Ashy Woodswallow Shrike

Taxonomy. *Artamus fuscus* Vieillot, 1817, Bengal, India.
Monotypic.
Distribution. Most of Indian Subcontinent (S to Sri Lanka) E to Myanmar, S & SE China (including Hainan), Thailand (except S) and Indochina.
Descriptive notes. 19 cm; 37–42 g. Has slate-grey head with darker mask (lores and area around eye), greyish-maroon mantle and pinkish-grey underparts; white-tipped tail with narrow greyish-white horseshoe-shaped band across uppertail-coverts; iris dark brown; bill pale blue-grey, tip black; legs grey to dark grey. Sexes similar. Juvenile resembles adult, but has browner upperparts, with buff feather fringes on mantle, wing-coverts and remiges, and pale buffish-grey throat and underparts with distinct brownish barring.
Voice. A frequently uttered wheezy "chee-chee-chee" or harsh nasal "chek"; also a long pleasant twittering song starting and ending with harsh "chack" notes.
Habitat. Open wooded country, often with palm trees, also cultivations, to c. 2100 m.
Food and Feeding. Insectivorous. Obtains most of its prey in flight. Glides and circles in air in search of food items; also sallies from treetop or other perch, pursuing insects in flight. Sometimes captures items on ground or other solid substrate. Forages singly, in pairs and in small flocks.
Breeding. Season Mar–Jul; laying Feb–Jun in Sri Lanka. Nest a shallow loose cup of rootlets and other fibrous material, placed up to c. 12 m above ground, often at junction of palm frond with trunk; occasionally in tree hole. Clutch 2–3 eggs. No other information.
Movements. Generally resident, with some local wandering dependent on weather conditions and



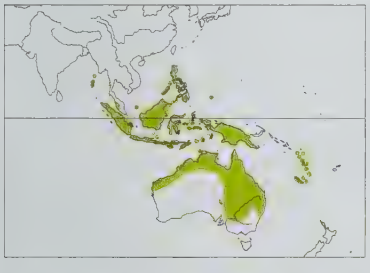
abundance of food. Some post-breeding movement from higher-lying areas (above 1000 m) to lower levels.
Status and Conservation. Not globally threatened. Widespread, and fairly common to common over most of its range. Somewhat patchily distributed in W of range. Occurs in many protected areas in most countries within its range.
Bibliography. Chen Fuguan *et al.* (1998), Cheng Tsohsin (1987), Étchécopar & Hüe (1983), Grimmett *et al.* (1998), Henry, G. M. (1998), Inglis (1951), Inskipp & Inskipp (1991), King *et al.* (1975), Lei Jinyu & Liu Yang (2006), Lekagul & Round (1991), Liu Yang & Lei Jinyu (2005), MacKinnon & Phillipps (2000), Meyer de Schauensee (1984), Nguyên Cu *et al.* (2000), Rasmussen & Anderton (2005b), Robson (2000), Smythies (1986), Yan Chongwei & Xu Weishu (1996).

2. White-breasted Woodswallow

Artamus leucorynchus

French: Langrayen à ventre blanc **Spanish**: Artamo Ventriblanco
German: Weißbauch-Schwalbenstar
Other common names: White-breasted Swallow-shrike, White-rumped/Lesser/Ashy(!) Woodswallow

Taxonomy. *Lanius leucoryn* Linnaeus, 1771, Manila, Luzon, Philippines.
May belong to the superspecies that contains *A. monachus*, *A. maximus* and *A. insignis*, but sympatric with first of those in Sulawesi; replaced by *A. maximus* at higher elevations in New Guinea. Sometimes treated as conspecific with *A. mentalis*, but differs in plumage and voice. Proposed races *celebensis* (from Sulawesi) and *longipennis* (Peleng, off E Sulawesi) considered synonymous with *albiventer*. Geographical variation uncertain and validity of some races questionable; reassessment of races required. Original spelling of species name has almost never been used; current spelling is valid under the Code, due to prevailing usage; sometimes spelt *leucorhynchus*, which becomes an unjustified emendation. Nine subspecies currently recognized.
Subspecies and Distribution.
A. l. humei Stresemann, 1913 – Coco Is (N of Andamans) and Andaman Is.
A. l. leucorynchus (Linnaeus, 1771) – Philippines, Sulu Is, Natuna Is, and Borneo (including islands off N coast and Maratua, off E coast).
A. l. pelewensis Finsch, 1876 – Palau Is, W of Micronesia.
A. l. amydrus Oberholser, 1917 – Sumatra, W Peninsular Malaysia, Bangka I, Java, Masalembu Besar (in E Java Sea), Kangean Is, and Bali.
A. l. albiventer (Lesson, 1831) – Sulawesi and Lesser Sundas (Lombok to Timor and Wetar).
A. l. musschenbroeki A. B. Meyer, 1884 – Babar and Tanimbar Is, in E Lesser Sundas.
A. l. leucopygialis Gould, 1842 – Moluccas, New Guinea, Aru Is and N & E Australia.
A. l. tenuis Mayr, 1943 – Banks Is and Vanuatu.
A. l. melaleucus (Wagler, 1827) – New Caledonia and Loyalty Is.



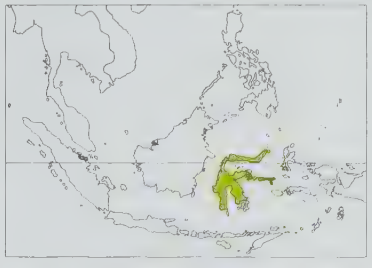
Descriptive notes. 18·5 cm; 36–49·6 g. Nominate race has head, chin, throat and upperparts dark slate-grey to blackish-grey or dark brownish-grey, except for white rump and uppertail-coverts; primaries and tail blackish, remiges and tail with thin white tip when plumage fresh; underparts white to creamy white; iris dark brown; bill pale blue-grey, tip black; legs dark blue-grey. Sexes similar. Juvenile is similar in pattern to adult, but more dark brownish with pale feather tips above, underparts sometimes washed light buff, upperwing-coverts and breast feathers tipped rusty or buff, tail more broadly tipped whitish, bill and legs brownish-horn. Races vary in overall size, bill size and wing length, also in colour of head and upperparts: *humei* has head to chin and throat bright slate-grey, paler than nominate, bill shorter; *albiventer* resembles previous, but with buff wash below, lores (sometimes to malar region) blackish, distinct colour change from greyish head to more brownish mantle, bill longer and finer; *amydrus* is very like nominate, but paler on hindneck, back and chin (though darker than previous race), usually lacks thin white margins on wing and tail feathers; *musschenbroeki* is like nominate but back less brown, and bill is stronger and deeper-based; *leucopygialis* has crown, throat and chin intermediate in colour tone between darker nominate and paler *humei*; *pelewensis* has head, chin, throat and back black, with no trace of grey or brown, tail entirely black; *melaleucus* has crown, chin and throat black, as previous but black of throat not extending so far onto chest, and back light brown; *tenuis* is like last but smaller, particularly in wing and tail lengths. Voice. Loud, brisk scolding "pirt pirt" or "aerk aerk", often given in flight; also nasal contact chatter, and pleasant chattering song including mimicry of other bird species.
Habitat. Open country with scattered trees, cultivation, light woodland, and mangroves; occasionally in forest clearings, commonly so in Andaman Is. Sea-level to 500 m, locally to 1500 m. Often near habitation; frequently attends herds of cattle or water buffalo (*Bubalus*).
Food and Feeding. Insectivorous. Prey usually harvested in flight above canopy; perches conspicuously before making aerial sorties. Forages singly or in small groups.
Breeding. Breeds Mar–May in NW of range, from Mar in Philippines, and Apr–Jun in Java; from Aug to Feb (mainly Sept–Jan), when and where propitious, in Australia, where sometimes two broods recorded. Sometimes breeds co-operatively, with up to five individuals attending a single nest. Nest built by both sexes, an unlined cup made of sticks and grass, placed in spout or hollow branch or in fork of tree, including mangrove, or in man-made structure (e.g. utility pole or fence post), or often in old nest of other bird species. Clutch 2–5 eggs, usually 3–4; incubation of eggs and feeding of nestlings by both sexes, helped by other group-members if present; no reliable information on duration of incubation and nestling periods; fledglings attended by both parents, and by any helpers present, for up to 50 days or more after leaving nest.
Movements. Resident in much of range. Nomadic locally; some N–S migratory movements in Australia.
Status and Conservation. Not globally threatened. Common locally throughout most of range; uncommon to fairly common in Coco Is, common in Andamans; rare in upper savannas of main island of Palau. Colonized W coast of Peninsular Malaysia in c. 1977, presumably having crossed sea from E Sumatra. Occurs in numerous protected areas over its broad range, e.g. Way Kambas National Park, in Sumatra, Bali Barat National Park, in Bali, and Rivière Bleue Reserve, in New Caledonia.
Bibliography. Barker & Vestjens (1990), Brüggemann (1876), Coates (1990), Dickinson *et al.* (1991), Doughty *et al.* (1999), Eck (1974), Étchécopar & Hüe (1977), Finsch (1876b), Grimmett *et al.* (1998), Hartert (1930), Higgins *et al.* (2006a), Holm *et al.* (2008), Johnstone & Storr (2004), Keast (1958), Mayr (1943a, 1944, 1962b), Meyer (1884), Neumann (1941), Oberholser (1917a), Ogilvie-Grant (1915), Rasmussen & Anderton (2005b), Schodde & Mason (1999), Serventy & Whittell (1976), Sheldon *et al.* (2001), Smythies & Davison (1999), Stresemann (1913, 1952), Watling (1983), Wells (2007), White & Bruce (1986).

3. Ivory-backed Woodswallow

Artamus monachus

French: Langrayen à tête noire **Spanish**: Artamo Cabecinegro
German: Weißrücken-Schwalbenstar
Other common names: White-backed(!)/Hooded/Celebes Woodswallow

Taxonomy. *Artamus monachus* Bonaparte, 1850, Sulawesi.
Forms a superspecies with *A. maximus* and *A. insignis*, this group perhaps including also *A. leucorynchus* and *A. mentalis*. Birds from Sula Is described as a geographical race, *sulaensis*, but regarded as insufficiently differentiated from those in rest of species' range. Treated as monotypic.
Distribution. Sulawesi, Lembeh, Banggai Is and Sula Archipelago.



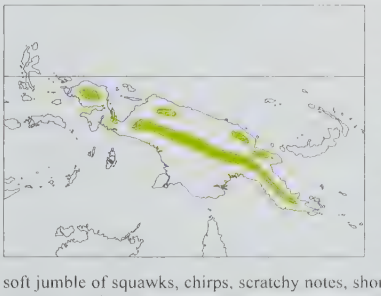
Descriptive notes. 19–20 cm. Most of plumage is white, with brownish-grey head and throat, black lores and chin, blackish-grey wing and tail; iris dark brown; bill pale blue-grey, tip black; legs blue-grey. Sexes similar. Juvenile undescribed. Voice. A series of monosyllabic notes, more metallic and penetrating than those of *A. leucorynchus*; also "tschirr-woouit", given twice.
Habitat. Forest, forest edges and openings, at 200–2000 m. Favours more heavily wooded areas than those occupied on Sulawesi by sympatric *A. leucorynchus*.
Food and Feeding. Insects. Soars and hawks above canopy of unbroken forest; perches at edge of small forest clearings, making short sallies. In pairs, in small groups and in flocks of up to 20 individuals.
Breeding. One active nest in late Jul; situated c. 15 m up tree, at base of large epiphyte. No other information.
Movements. No information.
Status and Conservation. Not globally threatened. Widely but patchily distributed in Sulawesi; generally uncommon but locally common at lower elevations. Less numerous than sympatric *A. leucorynchus*. Occurs in several protected areas, including Dumoga-Bone National Park.
Bibliography. Coates & Bishop (1997), Holmes & Phillipps (1996), Indrawan *et al.* (2006), Stresemann (1934a), Stresemann & Heinrich (1940b), Wardill *et al.* (1999), Watling (1983), White & Bruce (1986).

4. Great Woodswallow

Artamus maximus

French: Grand Langrayen **German**: Riesenschwalbenstar **Spanish**: Artamo Grande
Other common names: Giant/Greater/Papuan/New Guinea/Black-breasted Woodswallow

Taxonomy. *Artamus maximus* A. B. Meyer, 1874, Hatam, Arfak Mountains, New Guinea.
Forms a superspecies with *A. monachus* and *A. insignis*, this group perhaps including also *A. leucorynchus* and *A. mentalis*. Monotypic.
Distribution. Mountain ranges of New Guinea, from 800 m to 2800 m.



Descriptive notes. 20–21 cm; 52–69 g. Has head and throat to upper breast and upperparts (except rump) and tail dark slate-grey; rump uppertail-coverts and underparts white; white patch on inner leading edge of wing diagnostic in flight; iris dark brown; bill pale blue-grey, tip black; legs dark blue-grey. Distinguished from *A. leucorynchus* by larger size, darker plumage coloration, white wing patch. Sexes similar. Immature has light buffy mottling on back and white tips on wing and tail. Voice. Chattering "kakakaka..." given by perched groups; also an upslurred "chirp" or "cheep", often in flight. Seldom heard song a prolonged soft jumble of squawks, chirps, scratchy notes, short trills, and mimicry of other bird species.
Habitat. Mainly clearings and garden areas with dead trees, above 800 m; occasionally in tall emergents above canopy of primary forest. Sympatric with *A. leucorynchus* at lower elevations.
Food and Feeding. Insects, often quite large ones. Prey usually taken in flight and brought back to a perch, where held in the feet for dismembering. Launches sorties from tall perches, and soars sometimes for long spells (e.g. 135 seconds) without a wingbeat. Usually solitary when on the wing; sociable at other times.
Breeding. Breeding recorded in Aug–Dec (from middle of dry season to early wet season). Nest an open cup, usually more than 15 m up in dead tree. Most reports are of three nestlings fed by both parents and by other group-members. No other information.
Movements. Resident, so far as is known.
Status and Conservation. Not globally threatened. Widely distributed throughout all mountain ranges of New Guinea, where fairly common to scarce. In some places seems to be commensal with humans in towns.
Bibliography. Beehler (1978b), Beehler *et al.* (1986), Coates (1990), Diamond (1972), Gilliard & LeCroy (1967a), Loke Wan Tho (1957), Ogilvie-Grant (1915), Rand & Gilliard (1967).

On following pages: 5. White-backed Woodswallow (*Artamus insignis*); 6. Fiji Woodswallow (*Artamus mentalis*); 7. Masked Woodswallow (*Artamus personatus*); 8. White-browed Woodswallow (*Artamus superciliosus*); 9. Black-faced Woodswallow (*Artamus cinereus*); 10. Dusky Woodswallow (*Artamus cyanopterus*); 11. Little Woodswallow (*Artamus minor*).

5. White-backed Woodswallow

Artamus insignis

French: Langrayen des Bismarck **Spanish**: Artamo Dorsiblanco
German: Bismarckschwalbenstar
Other common names: Black-headed/Bismarck/Sclater's/New Britain Woodswallow

Taxonomy. *Artamus insignis* P. L. Sclater, 1877, New Ireland.
Forms a superspecies with *A. monachus* and *A. maximus*, this group perhaps including also *A. leucorynchus* and *A. mentalis*. Monotypic.
Distribution. New Britain and New Ireland, in Bismarck Archipelago.



Descriptive notes. 18–19 cm; 49–54 g. Head, throat, wing and tail are sooty black, remainder of plumage white; iris brown, pale greyish-blue eyering; bill pale blue-grey, tip black; legs pale blue-grey. Differs from *A. maximus* in slightly smaller size, white (not dark) back. Sexes similar. Immature has head tinged with brown, hindneck grey-brown (not white), and remiges and outer rectrices tipped white. Voice. A piercing upslurred, high "zwink zwink" the only call reported. Presumed song is a quiet fantail-like scratchy warble.
Habitat. Tropical moist lowland forest, including clearings and adjoining gardens; mainly in hills to 900 m, locally also in adjoining lowlands.
Food and Feeding. Insects. Prey taken on the wing. Makes aerial sorties from perches in dead trees; soars more in manner of *A. maximus* than does *A. leucorynchus*. Usually seen in groups of up to ten individuals.
Breeding. No information.
Movements. Resident; reluctant to cross water, though has been recorded as vagrant to Watom (off NE New Britain).
Status and Conservation. Not globally threatened. Locally common, but mostly either scarce or absent. Restricted to New Britain and New Ireland; absent from outlying islands in Bismarck Archipelago. Estimated to have lost 12% of its habitat on New Britain during 1990–2000.
Bibliography. Buchanan *et al.* (2008), Coates (1990), Dahl (1899), Dutson (2008a), Gilliard & LeCroy (1967b), Hartert (1925), Mayr (1955), Mayr & Diamond (2001).

6. Fiji Woodswallow

Artamus mentalis

French: Langrayen des Fidji **German**: Fidschischwalbenstar **Spanish**: Artamo de las Fiyi

Taxonomy. *Artamus mentalis* Jardine, 1845, Fiji Islands.
Sometimes treated as conspecific with *A. leucorynchus*, but differs in plumage and voice; the two may belong to the superspecies that contains *A. monachus*, *A. maximus* and *A. insignis*. Monotypic.
Distribution. W & N Fiji Is: Viti Levu, Vanua Levu, Taveuni and Gau.



Descriptive notes. 17 cm; 33–48 g. Head to chin, upperparts and wing are black, except for white rump and uppertail-coverts; tail black with white tip; underparts white, extending up over lower throat onto central ear-coverts; iris dark brown; bill pale blue-grey, tip black; legs grey. Differs from *A. leucorynchus* in having white (not black) lower throat and central ear-coverts, separated irregularly (not evenly) from black colour of head. Sexes alike. Juvenile is similar to adult, but with paler feather edgings above. Voice. Commonest call a rapid chatter; alarm "wit-wit-wit", with metallic quality. Song, heard infrequently, a mix of mellow whistles and chortling sounds.
Habitat. Open habitats, including cultivation and savanna, especially on drier sides of the larger islands; occurs also in urban habitat on Viti Levu (in Nadi and Suva). Lowlands; ascends into highlands on Viti Levu.
Food and Feeding. Insectivorous. Impressive aerial forager, with fast pursuit-flight. Seizes prey in aerial sally launched from conspicuous perch; occasionally pounces on items near ground; will also make sweeps over flowering plants, and snap at insects. Smaller items swallowed whole; large prey taken back to perch and dismembered before being consumed.
Breeding. Season Aug–Nov, sometimes earlier. Often breeds co-operatively, in group of up to six individuals. Nest, built by all group-members, cup-shaped, constructed from small twigs and grass stems, often placed in forked branch in tree canopy, sometimes in hollow in cliff. Clutch 2 or 3 eggs; incubation of eggs and feeding of chicks by all group-members; no information on duration of incubation and nestling periods.
Movements. Resident, with some local wandering. Family group will remain for several years in and around a tree in which they roost and nest.
Status and Conservation. Not globally threatened. Locally common. Apparently decreased in 20th century; in 1920, reported on various islands throughout Fiji except in S Lau Archipelago, but thereafter disappeared from many islands (e.g. Koro, Makogai, Kadavu, Yasayasamoala, and islands in N Lau Group). Following early loss of moist lowland forest and savanna (possibly its original habitat), this species seems to have adapted well to human-altered habitats.
Bibliography. Clunie (1973, 1976b, 1984), Eck (1974), Langham (1989), Mayr (1945b, 1962b), Pratt *et al.* (1987), Watling (2001), Wolters (1982), Wood & Wetmore (1925).

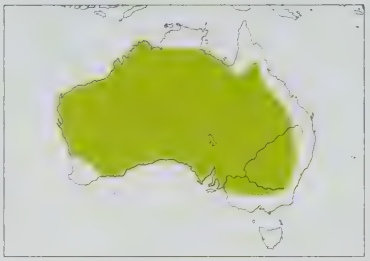
7. Masked Woodswallow

Artamus personatus

French: Langrayen masqué **German**: Maskenschwalbenstar **Spanish**: Artamo Enmascarado

Taxonomy. *Ocypterus personatus* Gould, 1841, southern and western Australia = York, Western Australia. Most closely related to *A. superciliosus*. Monotypic.

Distribution. Mainland Australia (except tropics N of 15° S, and E & SE coast, & SW forest).



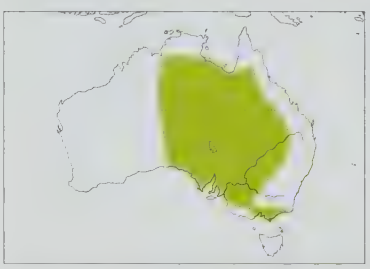
Descriptive notes. 18–20 cm; 25·5–42 g. A sexually dimorphic woodswallow. Male has face and throat black, bordered at rear by white crescent; crown and upperparts, including upperwing and tail, grey, tail tipped white; underparts white or whitish; iris dark brown; bill pale blue-grey, tipped black; legs grey to black. Female is similar to male but duller, with browner tinge, pale crescent behind facial mask indistinct, underparts washed brownish. Juvenile is like female but much duller still, mainly dark brown, greyer on wing and tail, streaked and spotted whitish above, diffusely streaked whitish below. Voice. Loud musical "chrrt" or "chapp-chapp", also softer "chrrup" sounds; some mimicry of other species. Song a soft twittering series.
Habitat. Inland shrublands, open woodland and adjacent farmland.
Food and Feeding. Largely insectivorous; feeds also on nectar, particularly in N of range (in austral winter). Insects taken mostly in air, during trawling flight high above vegetation; some pounced on from perch. Occurs in pairs and small groups; also in large flocks during migration.
Breeding. Season Jul–Mar (mainly Sept–Dec), mostly in S half of Australia. Nests solitarily, also in loose colony with nests 10 m apart; in E of range often in mixed colony with *A. superciliosus*. Once flock settles at a site, nest built rapidly, within one week, by both sexes, a shallow open cup made from twigs, grass, sometimes also rootlets and plant stems, lined with drier fine material, placed in fork of tree or shrub, or in end of hollow limb or stump, sometimes in old nest of other species. Clutch 2–3 eggs, rarely 1 or 4; incubation by both sexes, period c. 12 days; chicks brooded and fed by both parents, nestling period 12–13 days, occasionally longer; fledglings attended by parents for at least 12 days. Colonies often suddenly abandoned, probably in response to shortage of food.
Movements. Highly nomadic, most making post-breeding movement N into N parts of Australia, and returning S to breed in austral spring and early summer wherever food available. Travels in large flocks that may number more than 1000 individuals; in W half of Australia flocks tend to be largely monospecific, becoming mixed in E half, predominantly with *A. superciliosus* in Queensland, New South Wales and Victoria. Vagrant Tasmania, Lord Howe I, Norfolk I and New Zealand.
Status and Conservation. Not globally threatened. Widespread and common, but locally irregular, throughout its range. Has bred King I, in Bass Strait.
Bibliography. Barker & Vestjens (1990), Barrett *et al.* (2003), Blakers *et al.* (1984), Franklin (1999), Higgins *et al.* (2006a), Johnstone & Storr (2004), Joseph *et al.* (2006), McCarthy (2006), Schodde & Mason (1999), Serventy & Whittell (1976).

8. White-browed Woodswallow

Artamus superciliosus

French: Langrayen bridé **German**: Weißbrauen-Schwalbenstar **Spanish**: Artamo Cejiblanco

Taxonomy. *Ocypterus superciliosus* Gould, 1837, Hunter River, New South Wales, Australia.
Closest to *A. personatus*. Monotypic.
Distribution. Mainly C & inland E Australia; irregular in other parts of continent.



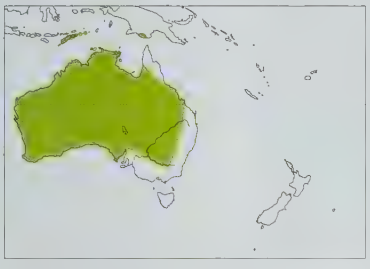
Descriptive notes. 18–19 cm; 30–41·1 g. Sexually dimorphic. Male is dark grey above and from chin to upper breast, with clear white eyebrow; tail tipped white; underparts below upper breast dark rufous; iris dark brown; bill pale blue-grey, tip black; legs lead-grey. Female is generally duller and paler than male, with brownish wash above, eyebrow less conspicuous, underparts below breast much paler. Juvenile is duller and browner than adult, heavily spotted and streaked whitish above and below, with prominent black lores, and grey wing and tail feathers with white tips; immature like adult, variable, wing and usually tail like those of juvenile. Voice. Contact call a high-pitched musical "tchep-tchep"; harsh scoldings; quiet song includes mimicry of other bird species.
Habitat. Inland shrublands, open woodland and adjacent farmland, also parks, less often forest edge; occasionally in built-up areas.
Food and Feeding. Largely insectivorous; feeds also on nectar, particularly in N of range (in austral winter). Nestlings fed with grasshoppers (Acrididae), cicadas (Cicadoidea) and large flying insects. Trawls high above the vegetation; makes sorties from perch, but sometimes pounces on visible prey. Occurs in pairs and small groups; also in large flocks, especially during migration.
Breeding. Breeds opportunistically Jul–Jan (mainly Sept–Dec) in S, irregularly in N. Nests solitarily, but more often in loose colony of up to c. 15–50 pairs, nests c. 10 m apart, sometimes in mixed colony with other woodswallows, mainly *A. personatus*. Nest built by both parents within a week of arrival at site, a loosely made shallow cup of twigs and grass, plant stems and rootlets, usually lined with finer material, generally at rather low height in tree fork, in hollow limb or stump, or behind bark, sometimes in creepers or in dense foliage, or in old nest of other species, occasionally in artificial site e.g. fence post or utility pole. Clutch 2–3 eggs, occasionally 1 or 4; incubation by both sexes, period 12–16 days, mean c. 13 days; chicks brooded and fed by both parents, nestling period 13–16 days, generally c. 14 days; fledglings continue to be fed by parents for at least a further 3 weeks after leaving nest. Colonies frequently abandoned suddenly, presumably because of food shortage.
Movements. Highly nomadic, most moving N in austral winter and returning S to breed in spring and early summer. Travels in large flocks of up to 200 individuals, often mixed with *A. personatus*; in C Australia numbers of present species in mixed flocks increase towards E, and in E of range (E of 140° E) present species predominates in such flocks and reaches farther S than its congener. Wanders irregularly over large parts of Western Australia, occurring sporadically in small numbers; shows similar pattern along coastal fringe of E Australia; vagrant to Tasmania and New Zealand.
Status and Conservation. Not globally threatened. Common locally, but irregularly, throughout its range. Has bred in Western Australia; has bred Tasmania. Possibly bred in New Zealand (South I) in 1970s.
Bibliography. Barker & Vestjens (1990), Barrett *et al.* (2003), Blakers *et al.* (1984), D'Ombrain (1934), Higgins *et al.* (2006a), Ingram (1973), Johnstone & Storr (2004), Joseph *et al.* (2006), Keast (1958), McCarthy (2006), Recher & Schulz (1983), Schodde & Mason (1999), Serventy & Whittell (1976), Sharland (1972).

9. Black-faced Woodswallow

Artamus cinereus

French: Langrayen gris **German**: Schwarzgesicht-Schwalbenstar **Spanish**: Artamo Carinegro
Other common names: Grey/Grey-breasted/White-bellied Woodswallow; White-vented Woodswallow (*normani*, *dealbatus*)

Taxonomy. *Artamus cinereus* Vieillot, 1817, Timor; error = south coast of Western Australia opposite Archipelago of the Recherche.
Race name *dealbatus* is a replacement for *hypoleucus* (itself a new name for *albiventris*, which preoccupied), since type specimen of *hypoleucus* is from an intergrade population. Geographical variation rather complex and not fully understood; races intergrade extensively where they meet, e.g. nominate race intergrading with *melanops* over very wide area across SW of species' range; further study desirable. Five subspecies currently recognized.
Subspecies and Distribution.
A. c. perspicillatus Bonaparte, 1850 – Timor, Leti and Sermata Is, in E Lesser Sundas.
A. c. melanops Gould, 1865 – N, C & inland SE Australia.
A. c. cinereus Vieillot, 1817 – SW Australia.
A. c. normani (Mathews, 1923) – SC New Guinea and NE Australia (C & S Cape York Peninsula, and inland NE Queensland).
A. c. dealbatus Schodde & Mason, 1999 – EC Queensland.



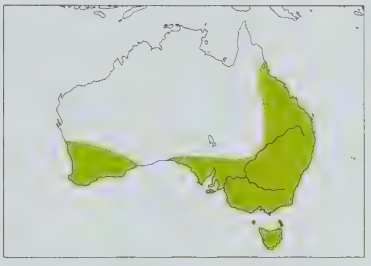
Descriptive notes. 18 cm; 30·9–40 g. Nominate race has head and upperparts brownish-grey, black from lores to upper throat, black rump and uppertail-coverts; tail black, all rectrices except central pair broadly tipped white; throat and underparts as above but somewhat lighter brown-grey, thighs blackish, vent black (occasionally a few small whitish tips); iris brown; bill pale blue-grey, tipped black; legs light slate-grey. Sexes similar. Juvenile differs from adult in having crown to hindneck browner and streaked whitish, black of face mask duller, upperparts brown with heavy whitish streaking, upperwing-coverts narrowly tipped white, remiges narrowly fringed white at tips, and throat and underparts finely streaked whitish. Races vary mainly in plumage tone, vent colour, and size: *melanops* is smaller than nominate, slightly less dark above and below, variable (somewhat darker below and with less black on throat in NW of range); *normani* is similar in size to previous, but has face mask smaller (not reaching throat), less extensive black on rump, vent and undertail-coverts white (not black) and sharply demarcated from belly, broader white tips on rectrices; *dealbatus* is very like last, but slightly paler below, with whitish belly centre, contrasting black band on rear flanks and across lowermost belly, also normally has slightly more extensive black on face (extending to throat); *perspicillatus* is similar to nominate but larger (largest race), and with white tips on all rectrices (i.e. including central pair). Voice. Very vocal, almost every movement accompanied by calls. Has noisy chattering call, like that of Common Blackbird (*Turdus merula*), when attacking an enemy; higher, drawn-out clamour, "tchiff-tchiff-tchiff", as contact; soft twittering song incorporating mimicry of other bird species, as well as all the other sounds of its own.
Habitat. Open woodland, shrubland and cultivation; absent from closed forest, where replaced by *A. cyanopterus* in SW Western Australia.
Food and Feeding. Insectivorous, taking wide variety of invertebrates. When locusts (Acrididae) present in plague numbers, becomes a specialist predator. Forages mostly aerially, by soaring and trawling, also by pursuing prey from a perch. In very windy weather, snatches prey from low perches or from ground. Forages in ones and twos, also in small flocks; often in mixed-species flocks.
Breeding. Season mainly spring to early summer, but eggs recorded in all months except Jun. Often breeds co-operatively, in groups of up to six individuals. Nest an open shallow cup, loosely made from rootlets, twigs and grass, sometimes lined with finer material, often unlined and so sparsely woven that eggs visible from below; placed 3–15 m above ground in tree or shrub, or in artificial site e.g. telephone pole, pylon or fence post. Clutch 1–5 eggs, usually 3–4; incubation by both sexes and by any helpers present, period 13–14 days, occasionally up to 17 days; chicks brooded and fed by all group-members, nestling period c. 18 days.
Movements. Generally resident; some movement reported, especially in N of range, but nature of this uncertain.
Status and Conservation. Not globally threatened. Widespread and locally common throughout range.
Bibliography. Barker & Vestjens (1990), Barrett *et al.* (2003), Beehler *et al.* (1986), Blakers *et al.* (1984), Crowley *et al.* (2004), Ford (1978), Higgins *et al.* (2006a), Horn & Vriens (1987), Immelmann (1960, 1963, 1966), Johnstone & Storr (2004), Joseph & Wilke (2006), Keast (1958), Macdonald (1967), McCarthy (2006), Mees (1968, 1982), Recher & Davis (2005), Rowley (1999, 2002b, 2006), Schodde & Mason (1999), Serventy & Whittell (1976).

10. Dusky Woodswallow

Artamus cyanopterus

French: Langrayen sordide **German**: Rußschwalbenstar **Spanish**: Artamo Sombrío

Taxonomy. *L(oxia) cyanoptera* Latham, 1801, New Holland = Sydney, New South Wales, Australia.
Races weakly differentiated, and they intergrade in S South Australia (Eyre Peninsula region). Two subspecies recognized.
Subspecies and Distribution.
A. c. cyanopterus (Latham, 1801) – E, CS & SE Australia, including Kangaroo I (South Australia), islands in Bass Strait (King I, Flinders I) and Tasmania.
A. c. perthi (Mathews, 1915) – SW Australia E to S South Australia (Eyre Peninsula).



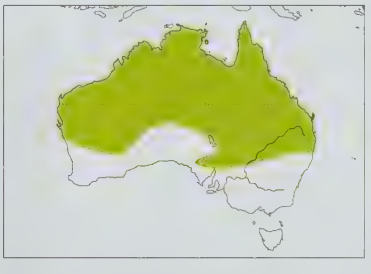
Descriptive notes. 18 cm; 21–47 g. Nominate race is mostly smoky grey-brown above and below; upperwing gunmetal-grey, white streak on outer web of outer 2–4 long primaries; tail black, all except central pair of rectrices tipped white; iris dark brown; bill pale blue-grey, tipped black; legs grey-black. Sexes similar. Juvenile differs from adult mainly in having dense whitish streaking above, tertials and upperwing-coverts with pale tips, narrow pale fringes on tips of remiges, diffuse pale streaking on underparts. Race *perthi* is very like nominate, but has less white on primaries (restricted to outer 2–3 long primaries) and less white in outer tail feather. Voice. Contact call a brisk "peet-peet", in flight or when perched; also brassy chirps or chirrups and a softer "vut-vut". Song quiet but animated, sometimes includes mimicry.
Habitat. Open forest, woodlands and agricultural areas receiving more than 400 mm annual rainfall.
Food and Feeding. Mostly insects; nectar and fruit, also some seeds, occasionally taken. Captures animal prey usually on the wing while trawling above canopy, or snatches items in pursuit from a perch. In windy weather may forage on the ground, and take ants (Formicidae). Forages singly or in small parties, sometimes in larger flocks; occasionally in mixed-species flocks.
Breeding. Season Aug–Feb (mainly Oct–Dec), in austral spring. Nests usually as simple pair; sometimes breeds co-operatively, with one or two helpers. Nest, built by both members of pair, an untidy, shallow open cup made from twigs, rootlets and grass, lined with finer materials (sometimes including horsehair), occasionally unlined, placed in crotch or fork of tree or shrub, in hollow limb or stump, behind bark or on weathered top of fence post. Clutch 2–3 eggs, sometimes 4, rarely 1; incubation by both sexes, period 14–15 days, sometimes up to 17 days; chicks brooded and fed by both parents, also by any helpers present, nestling period 16–19 days, generally 18 days.
Movements. General movement N during autumn–winter. Leaves Tasmania in Apr, migrants reaching N as far as Rockhampton (E Queensland); generally returns in spring to same breeding locality, arriving in Oct.
Status and Conservation. Not globally threatened. Common locally throughout its range. May have benefited from increase in available habitat following clearance for agriculture; such clearing, however, also permits competition with *A. cinereus* in Western Australia.
Bibliography. Baird (1991a), Barker & Vestjens (1990), Barrett *et al.* (2003), Blakers *et al.* (1984), Fulton (2005), Higgins *et al.* (2006a), Hindwood (1956), Johnstone & Storr (2004), Maddocks & Geiser (2007), Marchant (1986b), Rowley (1951, 2000), Schodde & Mason (1999), Serventy & Whittell (1976).

11. Little Woodswallow

Artamus minor

French: Petit Langrayen **German**: Zwergschwalbenstar **Spanish**: Artamo Chico

Taxonomy. *Artamus minor* Vieillot, 1817, Shark Bay, Western Australia.
Two subspecies recognized.
Subspecies and Distribution.
A. m. derbyi Mathews, 1912 – N & E Australia (S, in E, to N New South Wales and E South Australia).
A. m. minor Vieillot, 1817 – Western Australia (Pilbara and Murchison regions) E to ranges of S Northern Territory and NW South Australia.



Descriptive notes. 12 cm; 13·1–20·9 g. Nominate race is dark chocolate-brown above and below, becoming dark grey on rump and grey-black on uppertail-coverts, with deep gunmetal-grey wings and tail; somewhat darker, more blackish-brown, on face; tail tipped white on outer rectrices; iris dark brown; bill pale blue-grey, tip black; legs gunmetal-grey. Differs from similar *A. cyanopterus* mainly in smaller size and lack of white on primaries. Sexes similar. Juvenile is similar to adult but somewhat paler, has diffuse buff streaking above and below, buff tips on upperwing-coverts, and narrow buff fringes at tips of flight-feathers. Race *derbyi* is smaller than nominate, and perhaps more often has dusky cast to plumage. Voice. Vocalizes less frequently than other members of family. Brisk "peet-peet" (1–4 notes) in flight, also softer "peep"; song a pleasant soft twittering, including mimicry of other bird species.
Habitat. Open scrublands, rocky hills, cliffs and breakaways; also open woodland. Associated mainly with cliffs, escarpments and rocky outcrops.
Food and Feeding. Mainly insects; nectar taken occasionally. Captures prey generally in flight; occasionally among foliage or flowers, or on ground. Forages singly and in pairs, also in small flocks; occasionally in mixed-species flocks, usually with congeners.
Breeding. Not well known. Eggs recorded Sept–Jan. Occasional co-operative breeding, with one or two helpers. Nest, built by both sexes, a shallow open cup of sticks, grass, plant stems and similar material, flimsily constructed, placed on ledge in cave or in crevice among rocks, sometimes in hollow in tree. Clutch 1–4 eggs, usually 2–3; incubation period (for two eggs) 16 days or shorter; chicks fed by both parents, nestling period (for one chick) c. 16–20 days; one juvenile seen fed by both parents.
Movements. Not well known. Probably resident in some areas, e.g. parts of Western Australia; also partly migratory and locally nomadic.
Status and Conservation. Not globally threatened. Common locally throughout range. May have benefited in some areas from increase in available habitat following clearance for agriculture.
Bibliography. Barker & Vestjens (1990), Barrett *et al.* (2003), Blakers *et al.* (1984), Chapman (2000), Higgins *et al.* (2006a), Johnstone & Storr (2004), Schodde & Mason (1999), Serventy & Whittell (1976).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family CRACTICIDAE (BUTCHERBIRDS)



- Medium-sized to large passerines, most with longish wings, long tail, long and generally stout bill with hooked tip, ground-foraging species short-tailed; plumage black and white, sometimes with grey, two species with red.
- 18–57 cm.



- Australia and New Guinea.
- Rainforest, eucalypt forest and savanna woodland.
- 3 genera, 12 species, 43 taxa.
- No species threatened; none extinct since 1600.

Systematics

As was the case for much of the Australian fauna, early travellers and ornithologists tried to fit newly discovered birds into known families from Europe or Africa, and the cracticids were, therefore, thought to belong in the shrike family (Laniidae) or the crow family (Corvidae). J. Latham, in 1801, described the Grey Butcherbird (*Cracticus torquatus*), with its large hooked bill, in the shrike genus *Lanius*, and the Australian Magpie (*Cracticus tibicen*) in the genus *Coracias*, a roller (Coraciidae); the Australian Magpie was later placed by G. R. Gray in a new genus, as *Gymnorhina tibicen*. In 1837, J. Gould assigned Latham's "*Lanius torquatus*" to the genus *Vanga*, in which he likewise placed the Pied Butcherbird (*Cracticus nigrogularis*). He described the Pied Currawong (*Strepera graculina*), a large black bird the size of a crow, in the genus *Corvus*, although he later recognized the relationship of the three genera *Cracticus*, *Gymnorhina* and *Strepera*, believing them to be close to the Laniidae.

Some influential ornithologists were clearly uncertain about the relationships of these three genera. Thus, R. B. Sharpe, of the British Museum, initially placed *Strepera* in Corvidae while keeping *Gymnorhina* and *Cracticus* in Laniidae, in which he retained them when he later used the family Streperidae for *Strepera* alone. G. M. Mathews followed this arrangement in his 1912 publication *A Reference-List to the Birds of Australia*. J. A. Leach's anatomical study in 1914 established that *Strepera*, *Gymnorhina* and *Cracticus* were closely related, as Gould had asserted, and assigned them to the family Streperidae. Mathews, in Volume 10 of his *Birds of Australia*, published in 1923, placed the three together in the family Cracticidae (see page 46), and he maintained this in later publications, although the 1926 Royal Australasian Ornithologists Union *Checklist* used the family name Streperidae.

In the years between the 1926 checklist and C. G. Sibley and J. E. Ahlquist's publication on the Australian passerines, in 1985, the family included only the three genera *Cracticus*, *Strepera* and *Gymnorhina*. D. Amadon reviewed the family in 1951, and this formed the basis of the section on the Cracticidae in the 1962 volume of J. L. Peters's *Check-list of Birds of the World*, edited by E. Mayr and J. C. Greenway. None of these arrangements included the woodswallows (*Artamus*), until the studies based on DNA–DNA hybridization, by Sibley and Ahlquist, supported by the protein-allozyme studies of L. Christidis and R. Schodde, found that the old Cracticidae and the woodswallows were close relatives, with the New Guinea genus *Peltops* an early offshoot of the lineage giving rise to the butcherbirds, the Australian Magpie and the currawongs. *Peltops* had previously been classified as a monarch-flycatcher (Monarchidae), while the close relationship with the woodswallows had been hinted at by earlier anatomical studies such as those by W. P. Pycraft, Leach, W. J. Beecher and A. McEvey, which showed that the two genera shared some morphological characters, especially of the skull, in addition to the bluish-white bill. Sibley and Ahlquist treated the new group as the tribe Artaminae of their subfamily Corvinae within a greatly expanded family Corvidae. Current usage in Australia treats



Within Cracticidae, the butcherbirds (Cracticus) *possess the longest bills in relation to body size. That of the* ***Hooded Butcherbird*** *is also particularly wide and deep at the base, and very massive and powerful. The members of* Cracticus *have distinctive bluish-white bills, a feature they share with the woodswallows (Artamidae), a group which DNA analysis has shown to be the Cracticidae's closest relatives.*

[*Cracticus cassicus cassicus*, Tabubil, New Guinea. Photo: Pete Morris]



With the exception of the genus Peltops, *the Cracticidae are black, white and grey in plumage coloration. Species of denser habitats are predominantly black. The nominate race of the rainforest-living* ***Black Butcherbird*** *has a glossy blue-black back, and duller black underparts. However, immatures of the race* rufescens *may be either rufous-brown or dull black, and sometimes both plumage types are found in the same brood. Butcherbirds gradually acquire adult plumage over several years.*

[*Cracticus quoyi rufescens*, Kuranda, Queensland, Australia. Photo: Phil Gregory]

Artamidae as one of a number of families within the superfamily Corvoidea, following the 1994 *Taxonomy and Species of Australian Birds* by Christidis and W. E. Boles, Schodde and I. J. Mason's 1999 *Directory of Australian Birds*, and Christidis and Boles's 2008 *Systematics and Taxonomy of Australian Birds*.

Recent molecular studies by F. K. Barker and colleagues and by J. Fuchs have supported the relationship with *Artamus*, but have also corroborated the judgement made by Gould, who had named the Pied Butcherbird as a vanga and placed the Australian cracticids with the true shrikes in the family Laniidae. The work of Barker and colleagues suggests that the *Artamus–Cracticus* group is close to the Asian ioras (Aegithinidae) and the African bush-shrikes (Malaconotidae), helmet-shrikes (Prionopidae) and batises (*Batis*). More recent investigations, by Fuchs and by R. G. Moyle, suggest that, at some point 24–20 million years ago, one branch of an old corvoid lineage split to give rise to one lineage that dispersed out of Australia, and to another that diversified within Australia and New Guinea and from which arose the woodswallows, the butcherbirds, the Australian Magpie, the currawongs and the peltops species. The closest relatives of the Cracticidae and the Artamidae would thus appear to be helmet-shrikes, batises, bush-shrikes and ioras, and also the Bristlehead (*Pityriasis gymnocephala*) of Borneo. Earlier work by Sibley and Ahlquist had suggested that *Pityriasis* should be included with the cracticids, but studies by Moyle place it clearly with the malaconotid bush-shrikes.

The ancestral habitats of Australian passerines were probably the rainforests that covered much of the region more than 30 million years ago. As Australia became progressively drier, the rainforest diminished in extent until it was finally reduced to patches in the north and along the east coast. Some birds remained in the rainforests, whereas other adapted to the drier conditions and became widespread. At various times in the last 30 million years, most recently less than two million years ago, Australia and New Guinea were contiguous across what is now the Torres Strait. Some species that occur only or predominantly in New Guinea, and are widespread in rainforest habitats, such as the Black (*Cracticus quoyi*) and Hooded Butcherbirds (*Cracticus cassicus*) and the Highland (*Peltops montanus*) and Lowland Peltops (*Peltops blainvillii*), may have been isolated in New Guinea during an early period when the two landmasses were connected. Other species, such as the Australian Magpie and the Black-backed Butcherbird (*Cracticus mentalis*), may have evolved in drier habitat in Australia, and spread across the landbridge to the drier southern part of New Guinea during the most recent connection. At the same time, the Black Butcherbird may have spread to suitable rainforest or mangrove habitat in northern Australia.

Within the family Cracticidae, one area of discussion over many years has been the generic position of the Australian Magpie, which has often been placed in the monotypic genus *Gymnorhina*. Mathews briefly included this species within *Cracticus* in 1912, but he did not maintain that arrangement later. G. M. Storr, in 1952 and subsequent publications, treated the Australian Magpie as a member of *Cracticus*. Other authors have maintained *Gymnorhina*, while agreeing that further investigation is warranted. An unpublished study of the Australian species by R. T. Chesser and J. ten Have, based on mitochondrial and some nuclear DNA, has indicated that the Black Butcherbird and the Australian Magpie are each other's closest relatives, within the group of *Cracticus* species which is the sister-group to the *Strepera* species. Within the genus *Cracticus*, the Grey Butcherbird and the Black-backed Butcherbird are closely related, and there is some indication that, in *Strepera*, the Pied Currawong is closest to the Grey Currawong (*Strepera versicolor*), contrary to the usual view that it is most closely related to the Black Currawong (*Strepera fuliginosa*). Schodde and Mason, in 1999, maintained *Gymnorhina* as distinct from *Cracticus*, emphasizing its adaptations for terrestrial foraging, including long legs and a long, strong bill. Almost a decade later, Christidis and Boles followed Storr in placing the Australian Magpie in *Cracticus*, as they did not consider foraging adaptations sufficient reason for retaining *Gymnorhina* as a separate genus. This treatment is considered the preferable one in the present arrangement.

The Grey and Black-backed Butcherbirds have sometimes been placed in a separate genus, *Bulestes*, and the Black Butcherbird was at times accorded its own monotypic genus, *Melloria*, but there seems no good reason to retain these genera. As with the Australian Magpie, all three are currently treated within *Cracticus*.

Relationships among cracticids at the species level are not in dispute, with the exception of the position of the Australian Magpie. At the level of subspecies, however, a comprehensive review relating morphology to modern molecular-genetic analyses remains to be undertaken. Some recent studies, by L. Joseph and colleagues on *Artamus* and by J. M. Hughes and others on the Australian Magpie, have raised the possibility that the described morphological variation is of recent origin in response to ecological factors, and is not matched by genetic variation that would justify separation of populations at the subspecies level.



Butcherbirds have a style of flight which is fast, level and direct. They sometimes intersperse rapid, powerful flapping with shallower wingbeats, or gliding with wings held close to the body. In contrast, currawongs (Strepera) *have an undulating flight, their deep, jerky wingbeats interspersed with deeper swoops. The* ***Grey Butcherbird*** *has a white patch in the secondary coverts, which is visible in flight and is particularly well marked in the race* leucopterus. *There is a white tip to the tail, but this is normally abraded.*

[*Cracticus torquatus leucopterus*, Geelong, Victoria, Australia. Photo: Peter Fuller]

One poorly known member of this family is restricted to the island of Tagula in the Louisiade Archipelago, off south-east New Guinea. This is the Tagula Butcherbird (*Cracticus louisiadensis*), the relationships of which are uncertain. It appears to be close to the Hooded Butcherbird, which is widespread throughout New Guinea. Indeed, some authors have suggested that it might be conspecific with the latter. Until more is known about the Tagula taxon, however, it is probably better to treat it as a separate species.

The widespread species of the Australian mainland display considerable variation in size and plumage, as a consequence of which large numbers of subspecies have been described, with many regions of two-way and three-way intergradation between them and many hybrid forms. The degree to which this is matched by underlying genetic variation has been investigated only for the Australian Magpie. The detailed genetic studies carried out by Hughes, P. B. Mather and colleagues on a large number of individual magpies, representing all eight of the Australian subspecies currently accepted by Schodde and Mason, found little congruence between genetic variation and morphological variation. The main genetic differences are those between eastern and western birds, whereas the main morphological differences are between black-backed forms in the north and north-west and white-backed forms in the south. It is suggested that, whereas the black-backed form is less conspicuous and would be favoured in open, northern habitats, a white-backed variant would have survived in the better-forested, closed southern habitats and would have been favoured by sexual selection, females preferring white-backed males. It is questionable whether the recognition of so many subspecies of the Australian Magpie, with so much complex intergradation among them, and races often differentiated only by size, is appropriate. Further study of genetic differences between populations is required in order to shed some light on the situation.

The pattern of subspeciation in the widely distributed Australian species, the Grey and Pied Butcherbirds, is characterized by variation from east to west, as with the Australian Magpie, but neither Amadon nor Schodde and Mason recognized the many subspecies of these two species that were described in the past. For the Pied Currawong, with its north–south distribution in eastern Australia, and the Grey Currawong, extending from east to west in southern Australia, many subspecies are recognized, and it will be interesting to see how a future study of genetic variation in *Cracticus* and *Strepera* will compare with that found in the Australian Magpie. Joseph and Hughes and their respective colleagues have suggested that the morphological variation is of recent origin, in response to environmental factors, in populations that expanded rapidly after a period of aridity associated with Pleistocene glaciation, and that it is not matched by genetic variation.

Among Victorian populations of the Pied Currawong, Schodde and Mason distinguished two forms that differed from the medium-sized black-and-white nominate race of the east coast north of Sydney. One, from eastern Victoria, was a large sooty form with less white in the wings and tail than the nominate race, and the other, from western Victoria, was a small sooty-slate form with only traces of white. The large form was described as a new subspecies, *nebulosa*, while the small form was *ashbyi*, a name used by Mathews in 1913. Intermediates between these two races exist, and Schodde and Mason suggested that *ashbyi* is a regional form once separated from *nebulosa* but now being invaded, and genetically swamped, by it. S. T. Garnett and G. M. Crowley proposed that habitat changes in response to the end of Aboriginal burning regimes might have allowed the spread of *nebulosa*.

In the case of the Grey Butcherbird, the two north-western subspecies, *argenteus* and *colletti*, are separated from the other races of the species by significant desert barriers. These two are sometimes considered to represent a separate species, the "Silver-backed Butcherbird", a treatment recently preferred by Schodde and Mason, who considered that *argenteus* is at least as close to the Black-backed Butcherbird as it is to the Grey Butcherbird. The ranges of the three "species" do not overlap, and where that of the nominate race of the Grey Butcherbird abuts the range of the Black-backed Butcherbird there is no evidence that the two intergrade. The "Silver-backed Butcherbird" shares some plumage characters with the Grey Butcherbird and others with the Black-backed Butcherbird. Schodde and Mason believed that the relationships were better expressed by maintaining *argenteus* (with *colletti*) as a distinct species, forming a superspecies with the Grey and Black-backed Butcherbirds, until their relationships are better resolved by molecular analysis. The subspecies *colletti* is often subsumed into *argenteus*, but it seems to be reasonably distinctive.

Morphological Aspects

The Cracticidae are fairly typical passerines divided into three genera that have distinct modes of foraging, for which they exhibit morphological adaptations. The family covers a large range of sizes, from the small *Peltops*, 18–20 cm in length and with a body mass of about 30 g, to the Grey Currawong, 57 cm and

weighing up to 500 g, the last being crow-sized but not so robust as a *Corvus* crow. Between these extremes are the butcherbirds, ranging from the Grey Butcherbird, at 28 cm and 94 g, to the Black Butcherbird, 38 cm and 180 g, and the Australian Magpie, which is 40 cm long and weighs about 300 g.

Only the flycatcher-like genus *Peltops* of New Guinea, with its striking red rump and lower underparts, is an exception in its plumage, all other members of the family being characteristically black, white and grey in coloration. These plumage patterns render the butcherbirds, the currawongs and the Australian Magpie almost invisible when they are perched in the broken, patchy light in the open canopy of a eucalypt (*Eucalyptus*). The sit-and-pounce predators of open habitats, the Pied, Grey and Black-backed Butcherbirds, are the best example of this. Birds living in denser habitats are predominantly black. Many cracticids have extensive white patches on the wing, back or abdomen that are particularly obvious when the bird is flying. Only the Black Currawong of Tasmanian forests and the Black Butcherbird of the rainforests of New Guinea and north Queensland appear entirely black, although the Black Currawong does have a greatly reduced white wing patch.

With most of the species, sexual dimorphism in plumage is not marked, often being just a slight difference in pattern or a duller appearance that may enable the sex of individuals to be recognized. The males of most species are larger than the females. In the widespread Australian Magpie, some of the nine subspecies exhibit only slight plumage differences, whereas others are distinctively different. Males of the races *dorsalis*, *hypoleucus* and *tyrannicus* have a brilliant white back, their respective females having the back black with white scalloping.

The butcherbirds and the Australian Magpies, but not the peltops species or the currawongs, show a distinctive bluish-white bill with a black tip. This is a feature they share with the woodswallows, a group with which cracticids have been linked in many modern classifications (see Systematics). The bill of juveniles is typically leaden in colour, gradually acquiring a bluish-white appearance in one to two years in the case of the butcherbirds and two to four years in the Australian Magpie.

All cracticids are predators of insects and small vertebrates, but they catch their prey in different ways, as reflected in the details of their morphology. Some species also eat fruits and seeds. The butcherbirds have the longest bill in relation to body size within the family; the bill is strongly hooked. With their relatively long wings and tail, these species are effective, manoeuvrable strikers and pouncers. The bill of some butcherbirds, particularly the Black and Hooded Butcherbirds, is not only long, but also wide and deep at the base, very massive and powerful; this may be linked with the component of fruit in the diet or to the size of animal prey taken. Compared with the rest of the family, the ground-foraging Australian Magpie has long legs and a short tail for its size. Its bill has only a slightly hooked tip, is relatively shorter and stouter, and is used for probing and digging in the ground. The currawongs, although larger, are more slender than the magpie, and have a long bill, which is not hooked at the tip, and a long tail. Much of their foraging consists of arboreal scavenging and gleaning. Cracticids are strong fliers, the currawongs with a characteristic undulating flight in which the white patches in the wings of the Pied and Grey Currawongs are strikingly obvious. Australian Magpies have a strong direct flight, and are sometimes heard before the bird itself is seen, because of the whooshing noise produced by the wing movement as the bird passes. A white patch at the leading edge of the inner wing is very obvious as the magpie flies towards an observer.

Although the Cracticidae share many skeletal features with other corvoids, such as the single pneumatic fossa in the humerus, they have several distinct features of the skull, in the region of the palate and orbit, which they share with the woodswallows. One of the most easily observed of these is the presence of two zygomatic processes, instead of one; these are discussed in detail by Schodde and Mason. Many of these features were first described in the work by Leach, in 1914, demonstrating that the butcherbirds, the Australian Magpie and the currawongs are closely related (see Systematics).

Adults undergo a complete post-breeding moult during a period of three to four months, from early summer to mid-autumn. As the timing of the breeding season varies with seasonal conditions and latitude, so the timing of the post-breeding moult is variable. About three months after fledging, the juveniles undergo a partial moult of the body feathers in which the soft and loosely textured feathers are exchanged for those with the texture of adult feathers, but retaining the brownish streaky mottled pattern of immature plumage. In the case of the butcherbirds, the yearlings





*The **Grey Currawong** is the largest of the cracticids, at 52 cm and up to 500 g. Although raven-sized, it is not as robust as a corvid. The races are very variable in plumage tones and pattern, and for a long time four separate species were recognized, but they intergrade wherever they come into contact. The nominate race is mostly mid-grey, with a blackish face, crown and throat, white vent, and white tips of flight-feathers; the male is larger and darker than the female. The race* melanoptera *is the same size as the nominate, but is much darker, and lacks the white tips to the flight-feathers.*

[Left: *Strepera versicolor versicolor*, Canberra, Australia. Photo: Tony Howard.

Right: *Strepera versicolor melanoptera*, Anglesea, Victoria, Australia. Photo: Peter Fuller]





Previously classified as monarch-flycatchers (Monarchidae), the New Guinean genus Peltops *has been shown by DNA and protein-allozyme studies to be an early offshoot of the lineage that gave rise to the rest of the Cracticidae. At around 18 cm and 30 g, the peltops are the smallest members of the family. Their red rump and lower underparts are in colourful contrast to the black, white and grey plumages of the rest of the family. Both species live in tropical forest, but at different altitudes. The* ***Highland Peltops*** *is found in montane rainforest above 600 m, while the* ***Lowland Peltops*** *frequents lowland rainforest. The two do not overlap, and have strikingly different songs, but make use of similar parts of their respective habitats. They are observed most often in tall forest trees at the edge of open spaces, such as near landslips, treefalls or forest edge, and along roads or rivers. Large-headed and stout, with a powerful hook-tipped bill and forked tail, the Highland Peltops differs from the very similar lowland species in the usually more extensive white patch on the side of its head, and the larger and more conspicuous white patch on its upper back. Although the Highland Peltops is the larger of the two, its bill is the same size as that of its congener, and so appears proportionately smaller.*

[Above: *Peltops montanus*, Tari Gap, New Guinea. Photo: Pete Morris.

Below: *Peltops blainvillii*, Kiunga, New Guinea. Photo: Pete Morris]

have a post-breeding moult which may result in a more adult-like appearance but with some immature characteristics, such as streaks where the adult has white, and a generally browner appearance; some individuals may acquire full adult plumage at this stage. The Australian Magpie can take four or five years to gain the full appearance of an adult. In the second year, both sexes of this species have a female-like plumage, and by the third year most males display features of the adult male plumage, such as white on the back in the white-backed forms. For both males and females, however, a longer period is required before the glossy black feathers of the abdomen and the full extent of whitish on the bill are acquired. The moult of currawongs is not well known, but they appear to undergo a change from juvenile to immature plumage when about three months old, and then acquire adult appearance at about one year of age, with subsequent yearly post-breeding moults. No information is available on the moults of the two peltops species of New Guinea.

Habitat

Hardly any part of Australia or New Guinea is without at least one member of the family Cracticidae. The only areas in which none is found are the Great Sandy Desert of north-western Australia and the very high, treeless mountain regions of New Guinea. In Australia, the widespread Pied and Grey Butcherbirds and Australian Magpie live in open habitats, the open sclerophyll forests and woodlands that once covered large areas of Australia, including the belt of savanna woodland across the north. Here, the dominant tree species are usually eucalypts, but can also be species of acacia (*Acacia*), cypress (*Callitris*), paperbark (*Melaleuca*) or casuarina (*Casuarina*). A necessary habitat feature for these pouncing and ground-foraging birds is an open understorey of low grasses or shrubs. They live also in the more arid mallee woodlands, consisting of low-growing multi-stemmed eucalypts, and acacia woodlands where the understorey may be chenopod shrubland or spinifex grassland, which generally has large open spaces between individual plants. Provided that there are some trees available for nesting, roosting and loafing, these areas provide suitable habitat for the open-country butcherbirds and the Australian Magpie. A further *Cracticus* species, the Black-backed Butcherbird, lives in open habitats, but it is found only in the tropical savanna woodlands of the northern Cape York Peninsula, in Australia, and across the Torres Strait in southern New Guinea, either in eucalypt open forest or paperbark woodland with a grassy understorey. The population of Australian Magpies in New Guinea shares this habitat.

The remaining butcherbirds live in less open habitats. The Hooded Butcherbird and its apparently close relative the Tagula Butcherbird are found in dense lowland rainforest and second growth, to about 650 m. The former, at least, prefers areas with some open space, either treefalls in forest or along roads and rivers. In Australia and southern New Guinea, the Black Butcherbird is a species mainly of coastal habitats, riparian forests lining tropical rivers, rainforest patches and the extensive mangrove forests that fringe the coasts of southern New Guinea and northern Australia. In the rest of New Guinea, this species occupies forest, being found in most tropical forest types and plantations in the lowlands and up to about 1300 m. Finally, the two north-west Australian subspecies of the Grey Butcherbird, sometimes treated together as a separate species under the name of "Silver-backed Butcherbird" (see Systematics), live in coastal habitats, mangrove forest, riparian forest, small patches of rainforest and dense vine scrub.

Confined to New Guinea, the two peltops species both live in tropical forest, but at different altitudes. The Lowland Peltops frequents the canopy of lowland rainforest to an elevation of approximately 600 m, while the Highland Peltops is found in montane rainforest above this. The two do not overlap, and they have strikingly different songs. They are similar in the particular part of their habitat that they occupy: both species are observed most often in tall forest trees at the edge of open spaces, such as near landslips, treefalls or forest edges and along roads or rivers. J. M. Diamond observed that, in virgin forest, the two peltops species make use of tall trees emerging above the canopy, or on a ridge, from which they can sally out to catch insects.

The currawongs live in less open habitats than those preferred by Australian Magpies and Pied and Grey Butcherbirds. The primary habitat of the Pied Currawong is the open forests of east and south-east Australia, to the east of the Great Dividing Range and on its western slopes. This species extends into higher-rainfall open woodland, but not into the semi-arid and arid woodlands of



Aggressive towards intruders of their own species, cracticids also react very aggressively towards other species that may disturb them. Attacks are not confined to obvious predators posing serious threats, such as raptors and owls. ***Australian Magpies*** *will also mob small birds, such as Australasian Pipits* (Anthus novaeseelandiae), *reptiles such as snakes and goannas, and mammals such as possums, koalas and domestic cats. They are also notorious for attacking humans, particularly cyclists, during the breeding season, and every year people suffer serious eye injuries from such attacks.*

[*Cracticus tibicen tibicen*, Brisbane, Australia. Photo: Brian J. Coates]



Australian Magpies *have powerful feet with large, sharp claws, and during sustained attacks they may use these to cling to the victim. The target here is a Brown Falcon* (Falco berigora). *Mobbing, best known among Australian Magpies, is also performed by butcherbirds and currawongs. Alarm and rally calls are given to assemble the group, which flies at the intruder, often moving above and behind it, swooping down and pecking at its back and the back of its head. The intensity of the alarm call varies with the nature of the threat.*

[*Cracticus tibicen tibicen*, Geelong, Victoria, Australia.
Photo: Peter Fuller]

inland Australia; in northern Australia, one subspecies of this currawong lives in rainforest. The Pied Currawong is now resident in some east-coast cities, Canberra, Sydney and Armidale, where mature parks and gardens with well-grown shrubs and trees provide food and shelter throughout the year. The Black Currawong, restricted to Tasmania and the islands in the Bass Strait, lives in moist mountain forest, both tall wet sclerophyll eucalypt forests, with canopy covering 70–90% of the ground below, and cool-temperate rainforests dominated by southern beech (*Nothofagus*.). It occurs also in tableland habitats, comprising moorlands, sedgelands and heathlands, so long as some trees are present. In the drier open forests of eastern lowland Tasmania, the Black Currawong is replaced by the Tasmanian subspecies *arguta* of the Grey Currawong, often known as the "Clinking Currawong". The Grey Currawong lives in a wide range of eucalypt forests and woodlands across southern Australia, from the tall wet sclerophyll forests and open forests of the south-east to those of the south-west, and through the eucalypt woodlands, including mallee woodlands, in between. In the drier areas of Victoria, South Australia and Western Australia, it may live in *Acacia* woodlands with a shrub or spinifex understorey, and even in arid shrublands where occasional trees are present. This species has not moved into cities as has the Pied Currawong, but it is often seen in exotic pine (*Pinus*) plantations and orchards. As land has been cleared for agriculture, more open habitat has been created for the Australian Magpie at the expense of the forests preferred by currawongs.

General Habits

Australian members of the family Cracticidae that live in or near towns or in closely settled areas are well known. These are the Australian Magpie, the Pied Currawong, and the Grey and Pied Butcherbirds. The other species, living only in more remote areas of Australia and New Guinea, are less well known, with a few brief reports of their social and other behaviour. The social life of the cracticids ranges from the large groups with complex mating and breeding patterns, as demonstrated by the Pied Butcherbird and some races of the Australian Magpie, to the pair-breeding Pied Currawongs that amalgamate into large migratory or nomadic flocks after the breeding season. In between are most of the other butcherbirds and the two peltops species of New Guinea, most observations of which are of pairs or small family groups in which one or more immatures remain with their parents at least until the next breeding season.

The Australian Magpie occurs throughout most of Australia and southern Papua New Guinea, and in all areas of its range pairs or groups are resident. Some or all defend all-purpose territories throughout the year. There is significant geographical variation in basic social organization and in the size of territorial groups; in some of this species' nine races, non-breeders form non-territorial flocks, which can contain as many as 100 individuals. Because of the Australian Magpie's commensal way of life, numerous brief accounts of its behaviour have appeared in Australian and New Zealand bird journals, summarized by P. J. Higgins and colleagues in 2006. Detailed studies have been carried out on the behaviour of several of the subspecies.

Australian Magpie groups are sedentary, remaining in the territory all year. The size of the territory varies with race and habitat, but no studies have yet investigated the relationships among habitat quality, group size and territory size. Not all subspecies are equally well known, and in Australia detailed studies have been done of the race *terrareginae* near Brisbane, in Queensland, and of *tyrannicus* in northern Victoria, by Hughes and co-workers, of the nominate race near Canberra, in the Australian Capital Territory, by R. Carrick, and of *dorsalis* in south-western Western Australia by I. C. R. Rowley and E. Rowley (Russell) and others. In the populations studied near Brisbane, most groups consisted of only two individuals during the breeding season; later, groups of up to five were observed, these including immatures until they dispersed before the next breeding season. Throughout Queensland and the Northern Territory, group sizes are small, of two to five individuals, and non-territorial flocks are not generally encountered. The fieldwork by Carrick near Canberra was one of the first detailed studies of demography and social organization of an Australian passerine based on marked individuals. The study areas included some with good breeding habitat for this species, as well as areas of poorer habitat. Carrick identified four types of territorial group, based on the quality of the territory held. The commonest type was a permanent group in a territory with good breeding and foraging habitat; such groups were the only ones to breed successfully. A second type consisted of marginal groups, with few breeding sites and poor foraging areas; these rarely bred successfully. Similarly, mobile groups, which defended a small breeding area and commuted to poor foraging areas, rarely succeeded in their breeding attempts. The fourth type, consisting of open groups, with no breeding sites, did not attempt to breed; they defended foraging areas against the non-territorial flock. As well as these various groups, there were non-territorial flocks, ranging in size from a few individuals to more than 100, which contained immatures and non-breeding adults, including failed breeders or birds that had lost a partner, and individuals that were not yet established in a group with a partner.

In southern populations of Australian Magpies, those in Victoria, Tasmania and South Australia, group sizes are significantly larger. Units of two individuals are rare, and groups generally

contain up to 15 adults, including more than one adult male and more than one adult female. In these groups, more than one female may nest, and in the study by Hughes and others up to five occasionally did so. Non-breeding flocks are also present, and in times of drought they can hold more than 100 individuals. Group sizes are largest in south-west Western Australia, where, in the early study by Angus Robinson, groups of 6–12 adults and subadults were recorded, with groups of up to 20 after the breeding season. A study carried out by P. Wood and H. F. Recher in Kings Park, a large area of parkland in central Perth, recorded groups of 2–9 individuals, with a mean of five, and the Rowley team's study of suburban magpie groups in an area of Perth bounded by riverine floodplain recorded groups of 2–13 at the start of the breeding season, with a mean of 6·1 over a nine-year period. No non-breeding flocks are seen in south-west Western Australia, where subadult males and females remain with the natal group at least until they are nearly two years old, when some males or females may disperse. The majority, however, stay with the natal group, and females eventually breed there, most groups having more than one breeding female. In the study in suburban Perth, the maximum number of white-backed males, those more than three years old, was seven, and the maximum of females was five. The largest recorded group, containing 13 individuals, included five adult males, five adult females, a single one-year-old female and two immatures from the previous breeding season. The studies by Hughes and others have shown that, in these large plural breeding groups of closely related individuals, the level of extra-group mating is very high (see Breeding).





*Groups of **Australian Magpies** may defend all-purpose territories throughout the year. However, among the different races there is significant variation in basic social organization, and in the size of territorial groups. Group organization and size is also influenced by habitat quality. All members of the group except the youngest juveniles take part in responses to intruders. According to the severity of the intrusion, responses range from parallel walking displays in boundary disputes with conspecific groups, to displays of increasingly aggressive swooping which may escalate into physical attacks. The victim of these Australian Magpies is a **Grey Currawong**. In this kind of attack, one or more birds fly above the victim, and force it to the ground. Group members are also aggressive to one another. This can involve puffing up the feathers to look larger and more intimidating, or a jab with a closed bill at an opponent. A more serious form of aggression within groups involves rushing at an opponent and jumping on its back, after which the birds may wrestle, lying on their sides on the ground and pecking at one another. Young birds may respond to aggression with submissive behaviour; juvenile Australian Magpies, for example, roll onto their backs with their feet in the air.*

[*Cracticus tibicen tibicen* and *Strepera versicolor versicolor*, Geelong, Victoria, Australia. Photos: Peter Fuller]



*After a cold night, cracticids may be found sunning themselves, as this **Black Currawong** shows. They may adopt a number of postures, from face down with the wings extended, to lying on their sides, or, as has been observed in Australian Magpies* (Cracticus tibicen)*, leaning against a surface such as a wall with the belly exposed. The feathers are ruffled to allow the warmth of the sun to penetrate. The birds may enter a trance-like state, in which it is possible for a human observer to approach them closely. A similar posture to this Black Currawong's has been observed in other families, when passively anting—allowing ants to run over them. This behaviour has not been observed in Cracticidae, where the few records of anting involve the birds placing the ants directly on their plumage.*

[*Strepera fuliginosa fuliginosa*, Tasmania. Photo: Don Hadden]

Groups, then, are formed by the retention of progeny within family parties. Such groups are remarkably stable over many years. For example, Wood and Recher's observations in Kings Park repeated a survey made six decades before by H. M. Wilson, and it was found that seven of the nine group territories recorded by Wilson were still occupied. The survival rate of established breeding adult Australian Magpies is high. For example, in ten of the 13 groups studied for ten years by the Rowley team, at least one individual that had been ringed in the first year of the study, in 1996, was still there at the start of the October 2005 breeding season. New birds joined established groups from outside only when the adult breeding male or female in the group disappeared. Established groups rarely broke up or disappeared; on the rare occasion when this was observed, it appeared to follow the disappearance of the dominant adult male in a group in which he was the only adult male. Carrick, in his Canberra study of what were smaller groups, reported a similar break-up or displacement of groups upon the loss of the dominant male. The larger groups studied at Seymour, in Victoria, by Hughes and others appear to be similar in most respects to those in south-west Western Australia.

Where all good breeding habitat is occupied all year by long-lived individuals, young birds are better off if they remain in their natal territory than if they disperse to poorer habitat. Large groups are better able to defend a good territory, and the act of allowing young birds to remain is, therefore, of benefit if the territory is good enough. There must, however, be a point at which the group is too large for the territory to support. It is tantalizing to speculate on the reasons for the observed differences in social organization of the Australian Magpie: pairs and no flock, a breeding group and non-breeding flocks, a large breeding group only and with no non-breeding flock. The type of social organization employed must reflect the balance between the production of juveniles, survival and the availability of good breeding habitat, but this information is not yet available for enough subspecies to allow the comparison to be made.

Such obviously group-living birds are automatically assumed to be co-operative breeders, any non-breeding individuals in the group helping to feed nestlings which are not their own offspring. In some early studies of Australian Magpies, probably of the south-east Australian race *tyrannicus*, introduced into New Zealand, C. J. Veltman failed to confirm the feeding of nestlings by group-members other than the mother and her male partner, and branded the Australian Magpie a species that was not a co-operative breeder. Work on other subspecies suggests that the magpie version of co-operative breeding is very much more complex than the simple helper-at-the-nest model would suggest; Australian



*Cracticids like this **Black-backed Butcherbird** use the bill for preening, except when dealing with the head and neck. These are raked with the claws, the leg being brought up over the wing. Quick bouts of preening may occur at any time, but during the hottest part of the day, cracticids of open habitats retire to the shade of trees to rest and preen more thoroughly. Intensive preening also follows bathing. Having bathed, flocks of Pied Currawongs* (Strepera graculina) *in Sydney preened in bouts lasting 5–10 minutes, first running the bill through the feathers of the throat and breast, and then through those of the wings and rump.*

[*Cracticus mentalis kempi*, Lotus Bird Lodge, Cape York, Queensland, Australia. Photo: Samuel Hansson]

Magpies are group-living and, in the case of some races, plural breeding, with a variable and sometimes very high level of extra-group mating (see Breeding). Groups may have non-breeding male and female members two or three years old, in addition to several adult males and females of breeding age. Studies by Hughes and others in Victoria have established that individuals other than the female parent and her male associate, if any, frequently feed the nestlings and, to an even greater extent, the fledglings. These helpers were birds in their first year or older, and studies of genetic relationships revealed that not all helpers were closely related to the nestlings that they fed, and that not all related potential helpers fed the nestlings. The Rowleys' observations at nests of the subspecies *dorsalis* in south-west Western Australia demonstrated that non-breeding group-members, generally young males or females, may help to feed the nestlings, but occasionally an old male brings food to a nest. Feeding at the nest by non-breeding helpers varies from group to group, but the feeding of fledglings by group-members other than the mother is more frequent. An important aspect of group behaviour in all studies, including that of Veltman, is the group defence of the territory, the nest and the fledglings. This is discussed in more detail later (see Breeding).

The defence of the territory is very much a group affair. All members except young juveniles take part. A constant element of territory defence is that of advertising by a kind of singing behaviour generally referred to as Carolling, a loud, melodious song given by all older group-members while standing with the head thrown back, the bill pointing up and the chest puffed out (see Voice). Early in the morning, bouts of Carolling are given, to which all neighbourhood groups respond. Border disputes and territorial intrusions are met with a variety of displays, from parallel walking displays in mild boundary disputes, with and without threat displays, to noisy aerial swooping displays involving all group-members and accompanied by loud alarm calls. Nesting Australian Magpies may direct these swooping displays at passing humans, sometimes causing serious injury to the latter (see Relationship with Man).

The basic threat display in aggression, both between and within groups, was termed the Puffed Posture by E. D. Brown and Veltman. The belly, flank and back feathers are erected, making the bird look much larger than it really is; the wings are held out from the body, depressed from the shoulder, showing the white wing patch, and the primaries are not fanned. In a slightly more intense threat, the bird stands tall, with the bill pointing down. This threat is most frequently directed by adults towards young individuals, especially those in their first year. There are many variants of this posture. In the most extreme one, the Elaborate Bill Down, the wings are drooped, with the primaries fanned, and the bird leans forwards while holding the body horizontal and the closed bill pointing down. A quick lunge with bill-snapping may also be given in any of these situations. Contact fighting within or between groups occurs at various levels. The lowest level involves a simple jab with the closed bill at an opponent. Rushing at the opponent and jumping on its back is a precursor to Wrestling, in which the two birds grip each other's feet tightly and peck each other, usually while lying on the ground on their sides. Somewhat more aggressive is a fight in which one or more individuals fly above another and force it to the ground, where they attack it. Finally, in the Dive-bomb, an aggressor knocks an opponent off a perch, flying at it and hitting it with force, this often accompanied by bill-snapping. The victim may fly away or it may stay and fight. This behaviour is frequently directed at human intruders near a nest.

Submissive or defensive responses to threats appear to occur most often within groups, and are given by young individuals, in their first or second year, in response to threats from adults. The threatened bird may crouch, with the feathers fluffed and the wings slightly drooped, or it may cringe, leaning away from the aggressor, with the folded wings held above its body. Young Australian Magpies, especially juveniles, most frequently respond to threat by lying on the back with their feet in the air; they may remain lying on the ground after the aggressor has departed. Angus Robinson, in his observations of the race *dorsalis*, recorded a Lyre-wing Submissive Display, given most often by immatures, and described also by Brown and Veltman. In this, the bird runs along with its wings extended and held above its back, slightly away from its body.

Australian Magpies, in addition to utilizing Carolling song, make use of a number of variations in flight for territorial advertisement and defence. Robinson described Tilt Flight, in which the bird tilts from one side to the other as it flies, with about five to seven wingbeats for each lateral tilt. This is sometimes performed also by intruding males as they escape through a rival group's territory, usually flying high above the treetops. In the Swoop Up display, described by Brown and Veltman, the displaying individual flies fast and directly 3–6 m above the ground, and then swoops upwards almost vertically for about 5 m. This occurs during inter-territorial clashes, or in a spontaneous boundary display. Another boundary display is that which Robinson termed the Semicircular Sally, usually performed by males, in



Pied Currawongs *bathe by wading into shallow water, squatting, and shaking the wings and dipping the head and back several times beneath the surface. They may repeat this up to four times, wading in and out of the water each time. They also bathe in rainwater dripping from leaves. A rather different form of maintenance also performed by this species involves scooping up mud or clay and rubbing it into the feathers while preening after bathing.*

[*Strepera graculina*, eastern Australia. Photo: Jean-Paul Ferrero/ Ardea]



*Cracticids vocalize throughout the year, and both sexes and all group members sing, but two categories of song are exclusive to dominant males. After the breeding season, and usually during the middle of the day, the main male in the group delivers a soft, extended song from a regular perch, known as Whisper, Warble or Autumn Song. The Whisper Song of the **Grey Butcherbird** contains elements of the Territorial and Breeding Songs, together with mimicry of other birds, and may continue for over an hour. The varied and complex Breeding Song is given early in the breeding season, starting before first light. It may advertise the male's location to females outside the group, as part of a system of extra-pair copulation.*

[*Cracticus torquatus leucopterus*, Flinders Ranges National Park, South Australia, Australia. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]

which the individual flies out to the nearest boundary from a central perch, then along the boundary for about 50 m, and then returns to its starting point. The flight is fast, direct and low. Many of these display-flights employ very noisy wingbeats; the human observer can hear the bird as it flies overhead and, without looking up, know that it is a magpie.

A group display involving the Carolling song is sometimes given when two groups of Australian Magpies are close together at a territory boundary, without fighting. In the Territory Carol, one individual begins a song with a short series of Warble Song elements (see Voice); it raises its bill above the horizontal and fluffs its breast and belly feathers. After the warble, a series of loud, long Carol elements is added by each bird in turn. Brown and Veltman suggested that there is a definite sequence in which the birds contribute their Carols.

Another group-living species of *Cracticus* is the Pied Butcherbird, which was studied in farmland on the outskirts of Brisbane, in southern Queensland, by Ann Robinson. Groups of 3–15 individuals, most commonly six, lived throughout the year in large territories of 13–22 ha. These groups contained at least one male and at least one female, but, since the birds could not easily be sexed on the basis of plumage, details of group composition are sparse. Groups contained an adult breeding female, young from the previous year, and other adults, some of which were offspring of the group from earlier years and some immigrants from other groups. Generally, only one female in the group bred, but occasionally a second female nested, albeit rarely successfully. Significant numbers of extra-group matings were recorded, as were many instances of intraspecific brood parasitism. Most individuals in the group helped to feed the nestlings and to look after the fledglings. Young stayed with the group at least until they were nearly two years old, when some dispersed; this timing coincided with the start of the second breeding season after the one in which they hatched. There was no indication that the young were evicted. Dispersing immatures eventually joined other groups, and there was no sign of a flock of non-breeding individuals. As with the Australian Magpie, much territorial defence was achieved by song, but relatively little information is available on other aspects of the Pied Butcherbird's territorial defence.

Other *Cracticus* butcherbirds are not well known. All are resident, and appear to maintain territories through the entire year. As with the Australian Magpie and the Pied Butcherbird, the most obvious method of territory defence is that of song, often given in antiphonal duets. There is little information on group size and composition for these species, apart from recorded observations that they may be seen in pairs or groups. In southern Australia, young Grey Butcherbirds have been recorded as remaining with their parents until the following breeding season, and helping to feed the young in the nest, but no studies of marked individuals have been undertaken. For the Hooded Butcherbird of New Guinea, W. S. Peckover and L. W. C. Filewood reported several pairs nesting quite amicably in close proximity to each other, while B. J. Coates quotes a report of four adults observed while feeding one nestling. In the light of the complex group structure of the Australian Magpie and the Pied Butcherbird, it is likely that some other species in the genus will have a similar social organization.

The two *Peltops* species from New Guinea are also resident throughout the year in a territory, but little more is known of their behaviour.

The best-known aspects of the behaviour of the currawongs relate to their movements and feeding habits, especially nest predation (see Movements, Food and Feeding). No detailed studies have been done on these species' social behaviour and social organization, which are consequently not well known. The seventh volume of the *Handbook of Australian, New Zealand and Antarctic Birds*, published in 2006, summarizes the many anecdotal reports and few detailed studies of the movements of the three *Strepera* species, the Pied, Black and Grey Currawongs. All are originally forest-dwellers, living in the forests of the Great Dividing Range of eastern and south-eastern Australia, of Tasmania and of south-western Australia. All three appear to be partial migrants, mostly altitudinal migrants, leaving the higher mountain forests for lower levels in winter; those pairs living in permanently favourable habitat are likely to be resident. Thus, unlike butcherbirds and the Australian Magpie, not all currawongs maintain territories throughout the year.

Pied Currawongs near Canberra studied by D. M. Prawiradilaga maintained breeding territories, including nesting and feeding areas, of 5–12 ha from August to December, while K. A. Wood's detailed study of several nests near Wollongong, in New



*Pairs or groups of **Australian Magpies** produce sequences of loud, melodious yodelling calls, known as Carolling. This is thought to have several functions, including territorial advertisement and defence, and group bonding. It is also used to signal that a good food source has been located. Other species join in duets, antiphonal singing or choruses, which may involve all group members, and which are thought to serve similar functions to Carolling. Carolling and territorial singing occur at all times of year, and at any time of the day. A senior male or female Australian Magpie normally begins a bout of Carolling, which is often performed from the ground.*

[*Cracticus tibicen tibicen*, Geelong, Victoria, Australia. Photo: Peter Fuller]

South Wales, reported a small breeding territory within a larger home range. In the latter case, both members of the breeding pair, but especially the male, defended a small area around the nest. The pair used a much larger home range when foraging, venturing up to 300 m from the nest, thereby covering an area of more than 20 ha. Within this area, other currawongs were observed to pass through, but they were not attacked unless they approached within 40 m of the nest. The family moved away from the area after the young had fledged. Whether the difference in territorial behaviour between Canberra and Wollongong is real or is just a matter of definition is not clear. Observations of other nests quoted by Wood suggest that territory size may vary with habitat.

In Tasmania, the Black Currawong is resident all year in some parts of the highlands, breeding in territories in spring–summer and remaining in flocks in winter, although some populations appear to descend to lowland areas after breeding (see Movements). The subspecies found on islands in Bass Strait, *colei* on King Island and *parvior* on Flinders Island, are both resident. Whether they maintain territories in their breeding areas is not recorded.

The third currawong species, the Grey Currawong, is generally thought to be sedentary, but it does seem to undertake some altitudinal movements (see Movements). Those living in Western Australia are said to maintain large permanent territories all year, but no detailed studies of Grey Currawongs have been carried out in any part of the species' range.

Among the cracticids, only the Australian Magpie and the currawongs form flocks at some time of the year. In the case of the former species, some of the races form flocks of non-breeding individuals while the breeders and their social group, if any, remain all year in the group territory. The non-breeding flock is made up of immatures, subadults, failed breeders and individuals that have lost a breeding partner. Currawong flocks may include breeding birds and their offspring that have left the breeding territory at the end of the season, and moved to different foraging areas in late summer and winter. Flocks of non-breeders probably exist throughout the year, and may remain separate from the flocks of breeders. The Pied Currawong in eastern Australia is most notable for its flocking behaviour, in part because of its loud, well-known calls and the size of its flocks, which can exceed 100 individuals, and partly because of range extensions to towns and cities. These built-up areas provide food all year around, so that birds which were once seasonal immigrants to, for example, Canberra, in the Australian Capital Territory, or Armidale, in New South Wales, are now permanent residents in those cities. Flocks of Black Currawongs are a familiar sight in Tasmania, but Grey Currawong flocks in southern Australia are much smaller, less noticeable and, in many areas, absent or no larger than a family group.

All members of the family are strong fliers, but there are clear differences between the currawongs and the butcherbirds. The flight of *Cracticus* species, which consist of the butcherbirds and the Australian Magpie, is fast, level and direct. These species sometimes intersperse rapid, powerful flapping with some shallower wingbeats or, in the case of the butcherbirds, short periods of gliding with the wings held close to the body. When flying through their own territories, Australian Magpies fly with shallow wingbeats, at or below the level of the treetops; intruders or strangers fly high above the treetops and use deeper wingbeats. The flight of currawongs is undulating, with deep, rather jerky wingbeats, interspersed with deeper swoops with the wings held close to the body.

When on the ground, butcherbirds may forage by hopping and, occasionally, running, although they usually pounce from a perch to the ground. Australian Magpies, with relatively long legs, are terrestrial foragers which walk or run, and will often, rather than flying, run a distance of 10–20 m in a rolling gait towards another individual or to a food source. Currawongs run or hop on the ground, sometimes moving in a succession of leaps.

Drinking is not an obvious feature of the behaviour of Australian Magpies, except during the summer months. In south-western Australia, in a habitat with long, dry summers, magpies were seen to bathe only infrequently, in pools left by rain. In south-east Australia, on the other hand, this species was found to bathe frequently in summer in shallow water, wetting the entire body by submerging in the water, fluttering the wings and wagging the tail. Such bathing is followed by a period of intensive preening. Most preening is done with the bill, except for the head and neck, which are raked with the claws, the leg being brought up over the wing in the indirect method of scratching. Allopreening is not often seen, occurring between a female and her offspring, although in one study a male was reported as preening an incubating or brooding female. In other studies, including that by Brown and Veltman, the observers recorded that allopreening by adult magpies was conspicuously absent.

Early on sunny mornings, after a cold night, these birds may sun-bathe. Many reports describe Australian Magpies as lying



*The calls of the **Black Currawong** include a musical "kar-week, kar-week", a long drawn-out rolling croak, and an incessant chattering scream. Although vocalizations in this species have been little studied, they are probably equivalent to the "currawong" call of the Pied Currawong* (Strepera graculina). *This has been found to be used in territorial advertisement, as an alarm call, in communication between members of a pair, and in flight by members of the flocks that form outside the breeding period.*

[*Strepera fuliginosa fuliginosa*, Mount Field, Tasmania. Photo: Peter Fuller]

on the ground, face down, with the wings extended to the side or meeting in front of the head, and the feathers ruffled; others describe the birds as lying on their side. The sun-bathing Australian Magpies observed in Perth parks were leaning with the back against a brick wall warmed by the sun, the sun's rays striking the exposed belly. Individuals in this posture appear to be asleep, and often they did not move until the observers were close beside them.

Relatively few observations have been made of the maintenance behaviour of other members of this family, although some details are available for two of the currawongs. Pied Currawongs bathe by wading into shallow water no deeper than about 15 cm, squatting, and then shaking the wings and dipping the head and back several times beneath the surface; the entire process may be repeated in one session of bathing, the birds wading in and out of the water up to four times. This species has been observed also to bathe in water dripping from leaves of trees following rain. In Little Desert, in Victoria, a group of about 20 Grey Currawongs gathered to drink in a pool of water, where they also splashed their wings while remaining near the edge of the pool.

Bathing is usually followed by preening. Flocks of Pied Currawongs in Sydney, for example, preened in bouts lasting 5–10 minutes, first running the bill through the throat and breast feathers, and then through those of the wings and rump. An interesting aspect of the preening behaviour of this species has been recorded in which, during or after bathing, the individual rubs mud, moist soil or clay into its plumage. One was seen to preen with damp clay for a period of 30 minutes, picking up soil in its bill and rubbing this into the plumage every 20 seconds or so; it took four breaks, in which it bathed for 10–15 seconds. After preening with mud in this way, it sometimes flew to a tree and continued preening, but it did not always wash the clay from its plumage afterwards. Similar behaviour has been recorded for the Grey Currawong. At Kinglake, in east-central Victoria, a family party of this species consisting of two adults and a juvenile, after having bathed in water-containers, proceeded to scoop up wet clay in the bill and then apply this to the body. The juvenile emitted squawking calls until an adult placed clay in its bill, whereupon it, too, daubed itself. All three individuals continued to apply clay to the plumage for about half an hour.

Anting has been recorded for the Black-backed Butcherbird in New Guinea and for the Australian Magpie and the Pied Currawong in Australia. The last two species, at least, placed ants (Formicidae) directly on to the plumage, but little else is known of this behaviour among the Cracticidae.

The usual daily routine of the Australian Magpie entails an early-morning Carolling chorus, the group challenging and replying to nearby groups. This is followed by a period of foraging, and in the middle of the day the birds retreat to trees, where they rest and preen; they are not in a tight group at this time, but spread through adjacent trees. Late in the afternoon, they indulge in a further period of foraging, before finally going to roost at last light. They usually roost together, having one or more favourite trees for this purpose. For the race *dorsalis* in south-western Australia, Angus Robinson described a Dusk Song, a repeated Carolling given by one of the group males from a high exposed tree in the territory, between sunset and nightfall, before going to roost with the rest of the group.

Few details are available on the roosting behaviour of other cracticids. The Grey Butcherbird roosts at night in trees, and has been known to use exotic pine (*Pinus*) plantations for this purpose. In a suburb of Sydney, the members of a pair were found to roost together in the same tree during the breeding season, but they roosted separately at other times. Similarly, in suburban Brisbane, Pied Butcherbirds usually roost in a tree near the nest-site when breeding. More information is available on the Pied Currawong. In a study near Armidale, this species was found to roost communally in forest during the cooler months of the year. In winter, flocks left the roost-sites in the early morning, from 06:15 to 06:25 hours, and moved into nearby built-up areas, where they foraged for much of the day, returning to the roosting sites in the late afternoon, between 16:55 and 17:20 hours. Farther south, at a site north-west of Melbourne, again in winter, Pied Currawongs dispersed in small flocks from their forest roosts





Pied Currawongs *forage by gleaning on the ground, and on the trunks and branches of trees. They probe in crevices and under loose bark, sort through litter, and turn over stones and cow dung in search of arthropods, snails and small vertebrates. On the ground, currawongs run or hop, sometimes moving in a succession of leaps.* ***Australian Magpies****, which do most of their foraging on the ground, have relatively long legs and short tails. They walk slowly, looking for prey on the surface. Smaller prey is consumed immediately, but larger items are held, shaken and bashed against the ground, or held with the feet and torn apart.*

[Left: *Strepera graculina nebulosa*, Canberra, Australia. Photo: Tony Howard.

Right: *Cracticus tibicen tibicen*, Lamington National Park, Queensland, Australia. Photo: Marie Read]



With their relatively long wings and tail, butcherbirds are effective, manoeuvrable strikers and pouncers. Although it will sally in pursuit of flying insects, the ***Pied Butcherbird*** *finds most of its food by perching on a branch, and scanning the ground. On spotting a spider, insect or perhaps a small vertebrate, it will drop to the ground to catch it. Butcherbirds are like shrikes (Laniidae) in their manner of handling prey: large items may be wedged into a crevice, or impaled on a thorn or barbed wire before being torn apart; surplus food may be cached in crevices or on thorns. Note the absence of the adult's white collar in this juvenile Pied Butcherbird.*

[*Cracticus nigrogularis picatus*, Mitchell Falls, Australia. Photo: Don Hadden]

each morning between 07:00 and 10:00 hours and returned in the late afternoon between 17:00 and 17:30 hours, spending the intervening time in nearby open areas. The roosting site of a winter flock of this species in Sydney varied, and the flock sometimes separated, its members using two or more sites for sleeping overnight; in the late evening, the birds dived into the crowns of tall trees, from where they gradually moved down into denser foliage.

Just as they are very aggressive towards individuals of their own species that intrude upon them, so do the cracticids react very aggressively towards intruders of other species. In the case of group-living species such as the Australian Magpie, the intruder is mobbed by all members of the group, and sometimes, if it is an owl (Strigidae) or raptor, also by birds from nearby groups or a non-territorial flock. Australian Magpies will also join a mobbing attack initiated by another bird species. Similarly, with pair-living species, the pair and its neighbours mob an intruder. Mobbing is best known for the Australian Magpie, but it is performed also by butcherbirds and currawongs. When the intruder is first detected, alarm and rally calls (see Voice) are given in order to assemble the group, which then flies at the intruder, often moving above and behind it, swooping down and pecking at the back of its head and its back. Magpies will mob large birds such as owls, including the Morepork (*Ninox novaeseelandiae*), and large raptors, including the Wedge-tailed Eagle (*Aquila audax*), small birds, the Australasian Pipit (*Anthus novaeseelandiae*) being one such example, mammals such as possums (Diprotodontia), koalas (*Phascolarctos cinereus*) and domestic cats (*Felis catus*), and reptiles such as snakes and goannas (*Varanus*). P. J. Higgins and colleagues, in the *Handbook of Australian, New Zealand and Antarctic Birds*, list many of the species of intruder the mobbing of which by individual species of cracticid has been described, and D. N. Jones's book *Magpie Alert* has graphic descriptions of mobbing attacks by Australian Magpies on many species, including humans, possums and koalas left permanently blinded by such attacks.

Play behaviour is a common activity of the Australian Magpie, especially juveniles and immatures, and is well described in the studies by S. M. Pellis and by G. Kaplan. Play by the Black Currawong of Tasmania was briefly described by B. C. Mollison, but there is no relevant information on the other cracticids, although they are likely to indulge in similar behaviour. Young siblings of the Australian Magpie play with each other or with an adult. Social play increases in frequency until it reaches a peak 10–14 weeks after fledging. Most of this play is between two individuals, and usually involves chasing, mock fighting or the manipulation of objects, and tug-of-war. One individual solicits play by crouching, with the bill open, in front of another, or by crouching behind another and tweaking its tail feathers, or by chasing on foot or in flight. Bouts of play can last for up to ten minutes. Young Australian Magpies often pick up leaves or twigs and manipulate them, and this may lead to a chase or tug-of-war with a sibling. Pellis found that about one-third of play episodes involved chasing, one individual flying behind another and trying to grab its tail feathers so as to bring it down to the ground. Such chases involve much swooping up and down, and are probably good practice for the swooping attacks and chases that will later be used in territorial defence and anti-predator behaviour. More than half of all play episodes involve play-fighting, sometimes initiated by an adult male. The two individuals often lie on their side on the ground, wrestling, with the claws interlocked. The varied nature of play by the Australian Magpie is demonstrated by the many descriptions of this behaviour cited by Higgins and colleagues.

Voice

The butcherbirds, currawongs and Australian Magpie produce some of the most beautiful songs to be heard in the bush and forests of Australia and New Guinea. Only the vocalizations of the Grey and Pied Butcherbirds and the Australian Magpie have been studied in any real detail, those of the last-mentioned being the best known. Vocalizations of other *Cracticus* species, especially those from New Guinea, are not so well known. All have an extremely varied repertoire of sounds, including loud, long-distance harsh alarm calls, extended melodious songs, soft individual warbling song, and a variety of other calls, including distress calls, begging calls by juveniles, and various soft grunting sounds given in close contact by females and juveniles or by the members of a pair. Vocalizations, including song, are produced thoughout the year, some during the night in the breeding season by the Australian Magpie. Both sexes sing, the butcherbirds

with extended duets and antiphonal songs, and the Australian Magpie with long, complex bouts of group-singing when all group-members join in, this usually known as Carolling. Higgins and colleagues presented sonagrams of some vocalizations of all Australian cracticids, and the compilation of recordings by H. Plowright includes examples of the voices of this family. There appear to be no published studies in which the vocalizations within the family Cracticidae have been compared.

In an unpublished study of the Grey Butcherbird, G. P. Johnson identified three main types of vocalization. The first type was those given by a pair or family group during the day, at all times of the year, the second was those given by males at dawn during the breeding season, and the third type was a quiet warbling song given by males only. The group song is the Territorial Song, heard early in the morning and throughout the day, with an evening peak. It is loud and rollicking, containing some harsh cackling and some melodious warbling elements, often of a yodelling character. This song includes antiphonal singing and duetting, and involves males, females and other group-members; its main function is in territorial advertisement. The songs are not stereotyped, and Johnson's study explored their complexity. In the breeding season, males sing an early-morning Breeding Song, starting up to an hour before first light, and lasting for 13–47 minutes. This is also a very varied and complex song, with no harsh elements. Johnson suggested that the song serves to advertise the male's location and condition to females outside his own group as part of a system of extra-pair copulation. She identified a third major category of song which she called Whisper Song, heard most often after the breeding season and in autumn, usually in the middle of the day. The singer is the main male in the territory, and he delivers, always from a particular perch, a song much softer than the Territorial or Breeding Songs and continuing for long periods of up to an hour and a half. The song may include mimicry and phrases of Territorial and Breeding Songs, sung softly and continuously. Its significance is not clear. In her study, Johnson compared Grey Butcherbird vocalizations with those of the Pied Butcherbird, a larger species overlapping in distribution with the former in much of Australia. She identified the same basic types of vocalization, the main difference between the two species being in the beautiful and well-known territorial song of the Pied Butcherbird, given as a solo song or antiphonal duet, or in family chorus. The basic elements are long-drawn-out, pure, flute-like notes, and the song is a slow progression of flute-like notes, as if a flautist were improvising at random, but in fact a series of notes is produced in sequence by one or more singers; these are well illustrated in the recordings by D. Lumsdaine made at Mutawinji, in western New South Wales. The few descriptions and recordings of the voices of other butcherbirds in Australia and New Guinea indicate that these species, too, have complex, melodious songs, but they are not well known.

Johnson considered that the songs of the Australian Magpie are also of the three main types identified for the butcherbirds. Territorial Song is represented by the Carol, an extremely loud song, described by Kaplan as a long series of slurred, melodious, flute-like yodelling sounds, usually preceded by a warble from one individual, a dominant male or female. Carolling is often performed on the ground, and is thought to have several functions, including those of territorial advertisement, of group-bonding behaviour, in group disputes, and of signalling that a good food source has been located. A number of song variants described are Dawn Song, Dusk Song and Moonlight Song, short, relaxed carolling songs heard at different times of the day, particularly in the breeding season; the Moonlight Song, for example, is given by one individual, mainly on moonlit nights in the breeding season. These songs most likely belong to the Breeding Song type, but this requires further investigation. The Whisper Song type identified by Johnson appears to match the Warble Song described by Kaplan and the Autumn Song described by Angus Robinson. The Warble Song of adults is described by Kaplan as "soft, undulating, tuneful, melodious, with rich tones and overtones". Warbles are often given in a long sequence by a single individual, often from a preferred high perch. The song is heard particularly in autumn and early winter, and bouts of singing can last for longer than one hour. It is not loud and, although the bird sings from a high perch, it does not perch conspicuously. In the Rowley team's study, a tall tree in the garden was used as a singing perch for Warble Song by a male of the local group; he sang regularly for long periods, but it was always very difficult to see him and to identify him from his colour rings.

The basic alarm call of butcherbirds and Australian Magpies is a loud harsh squawk. A wide variety of alarm calls of different intensities is produced by Australian Magpies in response to different terrestrial and aerial predators. One of the most recognizable calls, named the Rally Call by Robinson, is a loud two-tone or three-tone call, carrying a long distance, and given during the mobbing of an aerial predator and during flight towards an intruder into the territory or near the nest: "The impelling tone of this call is such that all members of the group except odd very young birds, rally to the place of danger". Descriptions of this call of the Australian races by various authors refer to a two-tone call, but the Rowley team's experience of the subspecies *dorsalis* in Western Australia and that of Robinson and other sources quoted by him is that the Rally Call is more often of two short notes followed by a longer one. As with the Australian Magpie, the alarm calls of butcherbirds vary with the type of threat.

Studies by Brown and S. M. Farabaugh and by K. Sanderson and H. Crouch have demonstrated geographical variation in the alarm calls and song of the Australian Magpie, as well as individual variation in the Warble Song of the subspecies *tyrannicus*. Brown and colleagues analysed warbles made by 23 individuals from six territorial groups and a non-territorial flock, and found 893 different syllable types, few of which were shared by more than five birds, and 67% of which were specific to an individual. More syllables were shared with group-mates and neighbours than with more distant individuals. Mimicry occurs in the adult Warble Song, and includes imitation of many other bird species and mammals, and even of non-animal sounds heard frequently in the territory. A male in one of the study groups of the race *dorsalis* in Perth, in Western Australia, produced a very convincing rendition of the sound made by the siren of a police car, often heard in his territory near a major road.

Although, in general, the whole range of the vocalizations of the three currawongs is little studied, one call in particular is very well known. This is the Currawong Call of the Pied Currawong, probably its territorial advertisement, but also serving other functions. Wood's study of a nesting pair of this species found that it was employed as a means of advertising the territory, as an alarm when a nest predator came near, in expelling an intruder, and as communication between the members of the pair. It is uttered also in flight by members of the flocks that form outside the breeding season. The vocalization in question is a loud ringing call of



*The bill of the **Australian Magpie** has only a slightly hooked tip, and is relatively shorter and stouter than in other* Cracticus *species. It is used for probing in the ground. The bird's probing behaviour is clearly not random, and experiments have shown that it is able to hear the movements of beetles and their larvae, earthworms and other prey below the surface of the ground.*

[*Cracticus tibicen tibicen*, Geelong, Victoria, Australia.
Photo: Peter Fuller]



Perching and pouncing species like the ***Grey Butcherbird*** *need habitats, such as woodlands of* Eucalyptus *and* Acacia, *with an open understorey of grasses and other low vegetation, where prey like lizards can be more easily spotted. However, they readily adapt to similar man-made habitats like farms, parks and gardens. Grey Butcherbirds will sally from perches to take flying insects. They are also reported to take small flying birds, although more often they seize them from behind while they are foraging on the ground, killing them by spearing their heads with their powerful bills.*

[*Cracticus torquatus leucopterus*, Port Augusta, South Australia, Australia. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]

two or three syllables, sounding like "curra-wong, curra-wong" or, in the case of Wood's breeding birds, "currah-currah-currong". It is probably variable within and between locations but, in the absence of detailed analysis, it is impossible to know if it is a single variable vocalization or something more complex. Johnson, in her comparison of cracticid vocalizations, identified a Breeding Song of the Pied Currawong, a song of two or three phrases, "ow-ooo, ow-ooo, ow-ooo", heard only in the breeding season, and unlike any other vocalizations given by this species. Bouts of singing are short, unlike those of the butcherbirds. The two other currawongs have an equivalent of the Currawong Call, frequently a noisy call, harsher and less ringing than that of the Pied Currawong, and often described as sounding like screams or croaks. Indeed, the Western Australian subspecies of the Grey Currawong, *plumbea*, is often referred to by the colloquial name of "Squeaker".

Finally, the two species of peltops in New Guinea are poorly known, but they appear to produce none of the ringing, melodious sounds of the other cracticids. Instead, various clicking and twittering sounds have been described for these species. Coates characterized the song of the Lowland Peltops as resembling the sound made by "winding a clock with a key".

Food and Feeding

The cracticids are predominantly predators of insects, other invertebrates, including earthworms (Oligochaeta), and small vertebrates, including frogs, small lizards and birds. Most members of the family eat seeds and fruits occasionally, while the diets of the currawongs include a much larger proportion of fruits, especially in the winter months, when insects are less active. Indeed, currawongs can at times become a pest in orchards and gardens (see Relationship with Man). The Pied Butcherbird and the Pied Currawong, as well as the two north-west Australian subspecies of the Grey Butcherbird, these last often separated under the name "Silver-backed Butcherbird" (see Systematics), have been recorded as feeding also on nectar of eucalypts and other flowering trees, such as those in the genera *Grevillea* and *Melaleuca*. Few of the species have been studied in detail, the exceptions being the Australian Magpie and the Pied Currawong. For most other cracticids, the best information available consists of anecdotal reports, as listed by Higgins and colleagues in the *Handbook of Australian, New Zealand and Antarctic Birds*.

The main foraging method of most butcherbirds involves simply perching in a tree or shrub and pouncing to the ground to catch insects or lizards, or sallying out from the perch to catch flying prey. These birds also move through the canopy, gleaning and snatching items from leaves and branches. The Black Butcherbird forages in the canopy of its rainforest habitat in New Guinea and northern Australia. Those living in the mangrove forests fringing the northern coast of Australia were recorded by R. E. Johnstone and Storr as foraging below the canopy on branches, tree trunks, prop-roots and the exposed mudflats, from which they seized crabs and small fish such as mudskippers (Gobiidae). Butcherbirds are also nest predators, and are extremely efficient at catching small birds, sometimes stalking them on the ground or taking them in the air. M. K. Tarburton recounted how a Pied Butcherbird dived into a tree and quickly swallowed three fledglings of a Willie Wagtail (*Rhipidura leucophrys*), after which it seized the tail of the attacking adult Willie Wagtail, manoeuvring the head into its bill, and killed it by crushing the head and neck.

Australian Magpies spend most of the time in feeding on the ground, and a large component of their diet is beetle larvae (Coleoptera) and underground insects. The probing actions of this species are clearly not random, and experiments by R. B. Floyd showed that the magpies were able to hear the sounds made by the insects, and to direct their probing at the source. A list of feeding observations made by A. B. Rose illustrates the opportunistic foraging of Australian Magpies: items taken included snails and slugs (Gastropoda), ants, beetles, earthworms, frogs, caterpillars, termites (Isoptera), grasshoppers (Orthoptera), lizards, a nestling turtle-dove (*Streptopelia*) and a snake.

Currawongs are the most omnivorous of the cracticids, with greater proportions of fruit and seeds in their diet, along with



In addition to perching and pouncing, and sallying, butcherbirds forage by moving through trees, gleaning and snatching. However, the prey of this ***Pied Butcherbird*** *is a snake, probably an olive whipsnake* (Demansia olivacea)*, a ground-living species, which the bird has probably carried into the tree to kill and dismember. Butcherbirds are efficient nest predators, well adapted to capturing and killing the adults at a nest, as well as the nestlings. While the Pied Butcherbird is a species of open woodlands, its congener the Black Butcherbird* (Cracticus quoyi) *is found mostly in closed canopy forests. The latter seems to vary its foraging behaviour according to its habitat. In the rainforests of New Guinea and northern Australia it may sometimes feed, like other butcherbirds, by pouncing on prey on the ground, but it mostly forages at heights of 8–30 m through the subcanopy and lower canopy. In mangrove forests, Black Butcherbirds hunt below the canopy on branches, trunks and prop-roots, and on the exposed mudflats from which they snatch crabs and small fish such as mudskippers. Rainforest was probably the original habitat of the ancestors of the butcherbirds, and species adapted to more open, arid habitats would have evolved as the climate became progressively drier.*

[*Cracticus nigrogularis picatus*,
Broome, Western Australia, Australia.
Photo: Steven David Miller/ naturepl.com]





Although the diet of ***Australian Magpies*** *consists mainly of insects and other ground-living invertebrates, they will take any other prey they find at ground level, including rodents and other small mammals. The piece of wire that can be seen through this rodent's body suggests it may previously have been cached. Australian Magpies will eat carrion when available, as well as the insects and maggots found on carcasses.*

[*Cracticus tibicen tibicen*, Geelong, Victoria, Australia. Photos: Peter Fuller]

insects and small vertebrates. They are also well known as nest predators, especially in urban environments, and studies of Pied Currawongs indicate that, in particular, they take the nestlings of small birds to feed to their own nestlings. They forage by gleaning on the ground and on the trunks and branches of trees, probing in crevices and under loose bark, sorting through litter, and turning over stones and cow dung in order to obtain the insects beneath. They eat a wide range of fruits, from both introduced and native trees and shrubs, foraging both on the ground and in trees; the detailed study by Prawiradilaga demonstrated the importance of the fruits from introduced garden shrubs and trees in the cold Canberra winter, when insects are hard to find. The two subspecies of the Black Currawong living on the Bass Strait islands feed on invertebrates in the piles of giant kelp (*Macrocystis pyrifera*) that are driven on to the beaches at certain times.

New Guinea rainforests harbour two aerial foragers of this family, the Lowland Peltops and the Highland Peltops. These feed on flying insects, which they catch by sallying out from a high perch, sometimes snatching prey from foliage. There have been no detailed studies of the biology of these two, but they are reported as catching beetles, bugs (Hemiptera) and moths (Lepidoptera), which they take to a perch to prepare for consumption.

A very characteristic feature of the feeding behaviour of some cracticids is the shrike-like habit of impaling larger prey on a spike or wedging it in a crevice. They then tear pieces from it, either immediately or at a later time. This is a commonly seen habit of butcherbirds and currawongs, less often practised by Australian Magpies, and is not known for the two peltops species. In addition, Australian Magpies and currawongs cache surplus food, poking it into a grass clump or other suitable hiding place.

Breeding

The nest-sites and eggs of all Australian members of the Cracticidae have been described, as have those of the mainland New Guinea butcherbirds. Little is known of the breeding biology of the Tagula Butcherbird of the Louisiade Archipelago, off the south-east coast of New Guinea. A few nests of the peltops species have been found, but little more is known about these two New Guinea taxa.

The butcherbirds, the Australian Magpie and the currawongs build a bulky, untidy bowl of sticks and twigs, in which they lay a relatively small clutch of 2–5 eggs, clutch sizes tending to be smaller in New Guinea. The breeding habits of the Australian Magpie have been studied in considerable detail at several locations in Australia, and also in New Zealand, where the species has been introduced. For those other species which live close to towns and cities, such as the Pied and Grey Butcherbirds and the Pied Currawong, there is much anecdotal information and many nest records. Ann Robinson attempted to unravel the pattern of mating and extra-pair paternity among Pied Butcherbirds and provided some information on breeding, and Wood made detailed observations of nesting by Pied Currawongs. In general, the species of northern Australia and New Guinea are not well known.

Some species in this family live in groups with complex mating systems, high levels of extra-pair or extra-group mating, and their own unique forms of co-operative breeding. In its simplest form, co-operative breeding is characterized by the presence of breeding and non-breeding mature individuals in a group; the non-breeding members are sometimes called "helpers", and they may contribute to the reproductive effort of the breeding female by feeding the nestlings or caring for the fledglings after they have left the nest. Helpers are important also in the defence of the nest and the territory and in their role in attacking predators and intruders. This following account of the group mating and rearing patterns of the Australian Magpie is based on studies by Hughes and many colleagues in south-east Queensland and at Seymour, in Victoria; on observations by the Rowley team in Western Australia, some in collaboration with Hughes; and on the study by Carrick near Canberra, in the Australian Capital Territory.

A comparison of breeding groups of the Australian Magpie showed that, in south-eastern Queensland, most consisted of a simple pair, occasionally with a juvenile from the previous breeding season that had stayed on. The subspecies involved is *terrareginae*. Farther south, near Seymour, groups of the local race *tyrannicus* were much larger, containing 3–15 individuals, with an average of eight, and two to as many as five nests per territory, a situation known as "plural breeding". Similar large plural breeding groups occur in south-west Western Australia, where the subspecies *dorsalis* has been studied by several ornithologists, some having identified as many as five females nesting within an area of 1 ha. In Victoria, observations at nests established that adults of both sexes, as well as juveniles and subadults, helped to feed nestlings and fledglings that were not their own. Similar behaviour occurs in Western Australia, but it was not recorded in the introduced population of Australian Magpies studied by Veltman in New Zealand, where the race concerned, probably *tyrannicus*, forms groups smaller than those in Australia.

Genetic studies of the Victorian population suggest that non-breeding individuals sometimes did not feed young to which they were related, and it was found that the presence of helpers did not lead to increased production of fledglings by the group over the period of the study. These results are contrary to two of the suggested explanations for the occurrence of co-operative breeding, namely that the helpers assist in the rearing of close relatives, and thus receive a genetic benefit, and that their contributions increase the productivity of the group.

Within the complex plural breeding groups, some individual nesting females had a particular male partner which remained

close to the nest when the female was incubating or brooding, and which assisted in feeding the young. When groups had several nesting females, not all had a male partner; females breeding for the first time were often unassisted, and were rarely successful, whereas older females were capable of rearing a brood without help. A study of hormone levels in breeding and non-breeding adult and subadult males of the subspecies *dorsalis* in Western Australia, carried out by L. G. Schmidt and co-workers, found that androgen levels were similar in adult males whether classed as "breeding" or as "non-breeding", but subadult males in the presence of adult males in larger groups had depressed levels of androgens. This was interpreted as being a consequence of behavioural inhibition caused by the presence of dominant breeding males.

Extra-pair or extra-group copulations are now known to be common in many avian mating systems, although the 1956 study by Angus Robinson of the race *dorsalis* of the Australian Magpie referred to a despot male which, he assumed, mated with all the females in the group. Hughes and colleagues tested this assumption in a population of this subspecies in Perth, in Western Australia, and found a very high level of extra-group copulations, with 82% of nestlings fathered outside the group, most by unknown males from outside the study area. In the Victorian population of *tyrannicus*, the rate was 44%. The reason for this discrepancy is not yet fully explained, but one difference between the two study populations is that the Western Australian one has a much lower level of dispersal of young than the Victorian population; both young breeding females and young adult males in a group may be the offspring of one or two surviving breeding females. It may be that females improve their reproductive success by not breeding with close kin. Another suggestion is that females involved in extra-group copulations are seeking to mate with the best possible male, with "good genes", but the studies of the Victorian population do not support this idea.

With the other well-known group-living species, the Pied Butcherbird, groups studied by Ann Robinson rarely contained more than one breeding female. Some of the other group-members were immigrants, and some were surviving offspring of previous years which stayed with the group for at least two years. Most individuals in the group help to feed the nestlings, but their presence does not appear to lead to greater production of fledglings, although there may be some benefit to the breeding female in that her total effort in feeding nestlings is reduced. Significant numbers of extra-group copulations occurred, as well as cases of intraspecific brood parasitism, in which the sitting female was not the mother of one or more of the fledglings from her nest. This study gives a fascinating glimpse of the mating patterns found in Pied Butcherbirds, but much more work will be required in order to provide a greater understanding of this species, visible differences between the males and females of which are, at most, slight. The nature of the social system of the Pied Butcherbird became apparent only when individually marked birds were studied.

Breeding and mating systems of other butcherbirds and the two peltops species are little known. There are a few observations of more than two individuals attending a nest, or of birds nesting very close together, but no other of these species has been investigated in detail. The breeding behaviour of Pied Currawongs has been sufficiently well studied to establish that this species breeds in pairs in a defended breeding territory, and observations of its two congeners, the Black and Grey Currawongs, suggest that they are similar in behaviour.

Among Australian cracticids with an extensive distribution, the timing of breeding varies considerably, being influenced mainly by latitude and the seasonal distribution of rainfall for any particular population. In general, butcherbirds, Australian Magpies and currawongs breed in spring and early summer. Most clutches are laid in September–October, with some early nests in August in warmer areas; clutches laid in November or December are usually replacements after earlier failure, or second attempts after successful rearing of a first brood.

In a study of the subspecies *dorsalis* of the Australian Magpie in south-western Australia, where regular winter rainfall is at its peak in June and July, a total of 286 clutches was monitored over a nine-year period. It was found that the first clutches were laid in the second or third week of August, with a peak in the fourth week, and the last clutches were laid at the end of October. Despite annual variation in the timing and quantity of rainfall, the start of breeding was very constant. In years with little rainfall in September and October, however, few late nests were found; on the other hand, in years when rainfall in these months was above average, some females attempted a second clutch after a late failure, and some even attempted a second brood after the



While most cracticids will eat seeds and fruits occasionally, currawongs include a much larger proportion of fruits in their diet, especially in winter, when insects are less readily available. In autumn, flocks of ***Black Currawongs*** *move down from the cool temperate woodlands and heathlands where they breed, and may enter orchards and suburban gardens. Similarly, Pied Currawongs* (Strepera graculina) *descend in flocks on native and introduced fruiting trees and shrubs. In cities such as Sydney and Canberra, where they once occurred only as non-breeding visitors, fruiting garden plants have enabled Pied Currawongs to become resident.*

[*Strepera fuliginosa fuliginosa*, Tasmania. Photo: Drew Fulton]

first had fledged. Information on re-laying after failure and the laying of a second clutch after a first has fledged is not available for other cracticid species because of the lack of studies of individually marked birds.

In cooler Tasmania, egg-laying by Black Currawongs is usually later, from late October, and in the high country of the Australian Alps, in south-eastern Australia, Pied Currawongs start laying one or two months later than at the lower altitude of Canberra. Breeding by the Pied and Grey Butcherbirds and the Grey Currawong of the arid parts of Australia has been recorded in most months following adequate rainfall. Available records for New Guinea butcherbirds and the two peltops species, as summarized by Coates, suggest that most breeding occurs in the middle to late dry season, mainly September–October, with some earlier and later nests from August to late December.

Breeding displays of cracticids are neither elaborate nor conspicuous, as would be expected for a male and female living together in a pair or group throughout the year. With such aggressive, territorial species, the frequent extra-group copulations are likely to be rushed and surreptitious. Perhaps for this reason, few detailed accounts of courtship or pre-copulatory displays exist, although there are many fragmentary observations, these summarized by Higgins and colleagues. The most comprehensive account of breeding displays is that of Wood, based on observations at nests of the Pied Currawong. He describes an Advertisement Posture, seen in the breeding season, when an individual of either sex lands near the nest, droops both wings and cocks its tail, holding this posture for 30–60 seconds, during which the bird does not crouch. In the Food-begging Display, the female gives the food-begging call of the juvenile while the male is in view; if she approaches him for food, she partly spreads her wings and quivers them quickly six to eight times while calling, sometimes with the tail held cocked. In the Solicitation Display, given by either sex, the currawong crouches, quivering both wings while looking at the individual of the opposite sex; this is similar to Food-begging, but no begging call is given. Sometimes the neck is extended, with the bill pointing upwards, and occasionally the tail is wagged sideways.

Wood described in detail one copulation of the Pied Currawong. At the start of the sequence, the male flew into the nest tree, where the female was perched a few metres above the nest. She dropped down through the tree, gliding over the nest and landing below it; as she did so, the male gave a short series of wing-quivering bouts, the Solicitation Display. When the female landed below the nest, she assumed the crouched Solicitation posture, with the head tilted back and the bill raised. She looked towards the male and bobbed her tail vertically, for about 90 seconds, in eight to ten bouts, while the male maintained the Solicitation pose, with the head not raised but the body feathers ruffled. The male flew to within 25 cm of the female, on the same branch, and immediately began to quiver his outstretched wings; at the same time the two touched bill tips 12–14 times, the female then cocked her tail, exposing her vascular cloaca, and the male mounted her briefly. The whole sequence, from the male's flight into the nest tree until copulation was complete, lasted about five minutes. Similar food-begging, wing-quivering solicitation has been described for the Pied Butcherbird and the Australian Magpie.

Nests have been described for all cracticids except the Tagula Butcherbird. The rest of the butcherbirds, the Australian Magpie and the currawongs all build a bulky, untidy nest, a flattened bowl of sticks and twigs, well lined with grass, shredded bark, casuarina needles, wool, vine tendrils, and similar soft material. Australian Magpies commonly incorporate into the nest fencing wire, lengths of electric cable, generally with bright plastic covering, or lengths of plastic string or rope, if such materials are available. This has been reported also for butcherbirds. Currawongs and Australian Magpies usually place the nest in a fork in the outer canopy of a tall tree, whereas butcherbirds tend to build in lower trees and saplings. Nests of the two peltops species are small and compact, and are generally placed in a horizontal fork in the outer canopy.

The nest is built by the female, with or without with assistance from the male. In the case of the Australian Magpie, the female alone builds, the male sometimes remaining nearby, but not in close attendance. Studies of the breeding behaviour of the Pied Currawong revealed that, in some instances, the male may help to gather material and even build the outer framework, but the female lines the nest. Observations of the better-known butcherbirds, the Pied and Grey Butcherbirds, indicate that males may help with nest-building.

The eggs of cracticids are more or less oval in shape, and variable in colour and markings both within and among species.



*Standing water can be relatively rare in the open, semi-arid habitats used by **Pied Butcherbirds**, so they make the most of sources such as drinking troughs and puddles of rainwater. They drink warily, peering around them after lifting the bill to swallow. They can, however, become very tame where they are fed regularly. Clearance of forests for agriculture has created new foraging habitat for Pied Butcherbirds, and together with the provision of water for livestock and irrigation, this has enabled them to extend their range, at the same time as urbanization is causing them to decline elsewhere.*

[*Cracticus nigrogularis*, Queensland, Australia. Photo: William Osborn/ naturepl.com]



Some cracticids live in groups, with complex mating systems and co-operative breeding. While little is known of the breeding behaviour of the two Peltops *species, their arrangements appear to be simpler. The* ***Lowland Peltops*** *is territorial, and the pair is present in the territory all year round. There are reports of additional birds, probably the single offspring of the previous year, helping out at the nest. In the family as a whole, courtship displays have been described for a few species. As might be expected of birds that stay together as a pair or group throughout the year, the displays are not elaborate, consisting, for example, of juvenile food-begging calls made by the female, and wing-quivering solicitation by both sexes.*

[*Peltops blainvillii*, Kiunga, New Guinea. Photo: Pete Morris]

Those of the Australian Magpie are pale blue or green in colour, sometimes with darker blotchy markings at the blunter end. The base colour of currawong and butcherbird eggs ranges from dirty white to grey, various tones of olive and brown, with darker blotchy markings at the large end. The eggs of peltops are poorly known, but are reported to be yellowish-white with a reddish tinge, and with dark blotches at the blunter end. Clutches are small, and exhibit little variation. Most species lay from two to five eggs, with a mean clutch size of three in Australia. New Guinea species tend to lay smaller clutches, and complete clutches of only one egg have been reported for *Peltops*. There is little information about the time intervals between the laying of each egg, in part because many cracticid nests are situated high up in trees. For the more accessible nests of butcherbirds, there are some reports of the eggs being laid at intervals of about two days.

Only the female incubates. While she is sitting, her male partner spends a lot of time close to the nest, either perched in the nest tree or one nearby, or feeding on the ground close to the nest. He may take food to his sitting partner. There are also times when the male is absent; from his observations of breeding Pied Currawongs, Wood interpreted this as indicating that the male was on excursions in search of extra-pair copulations. Incubation periods are not well known for most species of this family. The exceptions are the Pied Butcherbird, the Pied Currawong and the Australian Magpie, for which they are 20–23 days, and the few records for other members of the family seem to fall in this same range.

Nestlings of Australian Magpies and currawongs are naked on hatching, and down develops within one week. Butcherbirds, when they hatch, may be naked or covered with sparse down. All have acquired a juvenile plumage when they leave the nest; subsequently, butcherbirds and currawongs achieve adult plumage at about one year, but Australian Magpies may not gain full adult plumage until they are three or four years old. Other aspects of growth and development are little studied. Studies of the Pied Butcherbird, the Pied Currawong and the Australian Magpie indicate that the young leave the nest permanently after about one month, although for a few days before that time they may leave for short periods and sit on nearby branches. When they finally depart, their wings and tail are not fully grown, and they are capable only of scrambling, fluttering flight. They remain out of sight for about a week, perched inconspicuously in a tree, giving away their position by loud begging when an adult approaches with food.

Among group-living species, the male and female, and sometimes one or more helpers, once the eggs have hatched, begin to carry food to the nest. For the first week, the breeding female broods the nestlings almost continuously; she takes food delivered to the nest by others, and passes it on to the chicks. Later, when the nestlings have some covering of feathers, she leaves the nest from time to time in order to forage, and food is then delivered directly to the nestlings by the male and any helpers that may be present. In the case of the Pied Currawongs observed by Wood, once the female left the nest for extended periods, the male and female contributed more or less equally to the provisioning of the nestlings. In the group-living species so far studied, namely the Australian Magpie and the Pied Butcherbird, the contribution to brood-feeding made by individual group-members is very variable. Group sizes vary, as do the age and sex of the group-members and their individual relationship to the breeding female. Although observations at nests of Australian Magpies and Pied Butcherbirds have established that other group-members do help to feed nestlings, an understanding of which members help in this way, and why, is still a long way off. A great deal more investigation of the relationships among group-members, the paternity of the nestlings and the contributions of the different individuals is required.

Attempts to explain the contributions of helpers recognize that there has to be some benefit to the helper so as to balance the costs both of finding food for the nestlings and possibly of its own foregone reproduction. This benefit could be indirect, if the helpers are feeding nestlings with which they share genes, perhaps via their own mother, a so-called "kin benefit", or it could be direct, providing some tangible benefit to the helper, and also to the senior group-members that allow the helper to stay. From studies of Australian Magpies and butcherbirds hitherto, helpers appear to have little effect on the reproductive success of an individual breeding female that is assisted, and extra-group copulations reduce the degree of relationship between the helper and the nestlings. It is possible that other males in a group may share paternity of a brood, and thus feed their own offspring, but this has not been clearly demonstrated. Helpers may reduce the amount of work done by the breeding female or compensate for the absence of a male from the territory

when he is seeking extra-group copulations, but the studies to date are not sufficient to establish this.

Young cracticids, after they have left the nest, are fed for a variable period, probably from one to three months, although they often continue to beg noisily from adults for much longer. Pied Currawongs leave the breeding home range with their parents after about two months, and the family may join a mobile flock of adults and juveniles. Later, the young come together in a mobile, immature flock (see Movements). With the group-living cracticids, the juveniles remain with the group, gradually taking an increasingly greater part in group activities. In the case of Australian Magpies and Pied Butcherbirds, dispersal, if it occurs at all, does not generally take place until the young are approaching the second breeding season after the one in which they hatched.

Female Australian Magpies may breed for the first time when they are two or three years old. It is not possible to make a corresponding statement for males because of the high levels of extra-group copulations in which they indulge and the differences in group size among subspecies. Little is known of the age at which other members of the family first breed. The juveniles of those butcherbirds that are not generally group-living remain in the parental territory for most of their first year, some even staying long enough to assist in brood-feeding at their parents' first nest in the following year.

For those species for which the relevant information is available, the major causes of nest failure are predation by Australian Ravens (*Corvus coronoides*) and the loss of older nestlings in periods of bad weather with very windy conditions. Nests built in the outer canopy of tall trees are subjected to violent movement in strong winds. In a study of Australian Magpies in south-western Australia, for example, a number of strong cold fronts in late October in each of two years coincided with the second half of the nestling period, and several nests failed in the course of a few days. Once chicks leave the nest, they are susceptible to predation by foxes (*Vulpes*), domestic cats and dogs (*Canis*), and in towns and cities they are at risk from being struck by traffic, as well as being subject to the well-meaning attentions of people who "rescue" the helpless fledglings in their first few days out of the nest.

The main brood parasite of the cracticids is the Channel-billed Cuckoo (*Scythrops novaehollandiae*), recorded mainly from nests of the Pied Currawong and the Australian Magpie, and also a parasite of *Corvus* crows. There are a few records of butcherbirds being parasitized by the Common Koel (*Eudynamys scolopacea*), the main main hosts of which are large honeyeaters (Meliphagidae), particularly various species of friarbird (*Philemon*). In Wood's study in New South Wales, Pied Currawongs defended a small breeding territory, and 93% of attacks on intruders occurred within 40 m of the nest, although Channel-billed Cuckoos were attacked at 80 m and Australasian Goshawks (*Accipiter fasciatus*) at 50 m. Attacks involved dive-bombing, chasing, bill-snapping and alarm-calling.

Most information on nest success for this family relates to the Australian Magpie, supplemented by one study on the Pied Currawong. Annual variation in nest success can be considerable. Studies in most parts of Australia have found that, on average, about 50–70% of Australian Magpie nests succeed in producing at least one fledgling. In suburban Perth, in south-western Australia, the Rowley team studied 12–15 Australian Magpie groups of the race *dorsalis* over a nine-year period, during which a total of 289 nests was monitored. On average, 47% of nests produced at least one fledgling, with a mean of 0·74 fledglings per nest; over this period, the annual success rate varied from 27% to 83%. Because of the multiple nests in most groups, and some re-laying and renesting, however, 78% of groups produced at least one fledgling, with a mean of 1·7; about half of these fledglings survived their first year. It is difficult to calculate the survival rate of these yearlings to two years of age, as some apparent losses may be due to dispersal, but it was found that, for individuals more than two years old, average annual survival was 92%. Most groups included one or more adults at least ten years old; in 2004, for example, 21 of the 88 Australian Magpies in the 15 known groups had an age of ten years or more. The oldest individual in this study was at least 15 years of age when study of his group ceased. High survival of adults is probably common to all subspecies of the Australian Magpie. In the Australian Capital Territory, for instance, Carrick's study of the nominate race found a survival rate of 84% for adult males and 86% for adult females. For the Pied Butcherbird, the only other species for which there is corresponding information, Ann Robinson estimated adult survival of approximately 71%; 59% of fledglings survived to one year, and at least 82% of yearlings survived to two years.



*The breeding systems of the **Australian Magpie** vary geographically with race, from pairs assisted by yearlings to groups with several adult males and one or more breeding female, assisted by non-breeding adults and juveniles. Like the butcherbirds and the currawongs, Australian Magpies build a bulky, untidy, flattened bowl-shaped nest of twigs and sticks. The female alone does the building, over a period of 2–3 weeks, using mainly sticks and often exotic materials such as coloured electrical cable or fencing wire. The inner cup is lined with wool, grass and shredded bark. A female will frequently nest in the same tree in successive years, and several breeding females in a group may nest in adjacent trees.*

[*Cracticus tibicen tibicen*, Brisbane, Australia. Photo: Brian J. Coates]



Most species lay two to five eggs, with a mean clutch size of three in Australia, and fewer in New Guinea. Single eggs and single fledglings are reported for the two Peltops *species. Cracticid eggs vary in colour; those of the* ***Pied Butcherbird*** *may be olive to brown, buff, grey or green, with spots or blotches of brown of various shades, mixed with black dots, concentrated at the larger end. Only the female incubates. The male spends much of the time perched or feeding nearby; he may bring her food. However, the male may also absent himself, in pursuit of extra-pair copulations.*

[*Cracticus nigrogularis nigrogularis*, Toganmain Station, New South Wales, Australia. Photo: Graeme Chapman]

Movements

The cracticids for which detailed information on movements exists are the Australian Magpie, the Grey and Pied Butcherbirds and the Pied Currawong. For other Australian members of the family, an analysis by P. A. Griffioen and M. F. Clarke of data from the second *Australian Bird Atlas* is the only information available, in addition to anecdotal reports. Some information is derived from the recovery of ringed birds, but, apart from the four better-known species, the numbers of cracticids that have been ringed are low. Ringing data from the Australian Bird Banding Scheme are summarized by Higgins and colleagues, who also list many anecdotal accounts indicating that some members of the family move from place to place while others remain in a local area. Movements of the New Guinea cracticids have not been studied, but these populations appear to be more or less sedentary.

Cracticus species are generally characterized as sedentary, and are recognized as being territorial all year. Studies of marked populations of Australian Magpies and Pied Butcherbirds suggest that dispersal by immatures in their second year or later rarely extends over more than 10 km, and this conclusion is supported by ringing data. Of 16,022 Australian Magpies ringed over a period of 50 years, 91% of 1095 recoveries were made less than 10 km from the ringing site. Over the same period, fewer (877) Pied Butcherbirds were ringed, but 98% of the 158 recoveries were within 10 km. Analyses of the Atlas records by season shows no large-scale movements for the less well-known species. Nevertheless, genetic analysis of Australian Magpies from north of Brisbane, from eastern New South Wales, from western Victoria and from south-western Australia revealed a surprising lack of difference among populations, especially in southern and eastern Australia. If dispersal were always over small distances, less than 10 km, different populations would be expected to exhibit genetic differences; conversely, if there is gene flow between populations owing to long-distance dispersal, genetic differences between those populations would be slight. The lack of genetic differences between Australian Magpie populations in south-eastern Australia suggests that some long-distance dispersal does occur, and the few long-distance recoveries of ringed Australian Magpies indicates that this does happen on a small scale, enough to produce the observed genetic uniformity. The Australian Magpies from south-western Australia showed greater genetic differences from the south-eastern populations, from which they are separated by the extensive barrier of the Nullabor Plain.

Additional evidence that Australian Magpies are more mobile than would be expected from sightings of marked individuals in their territories comes from translocation studies undertaken by Jones and others. Some male Australian Magpies, in defence of their nests, attack humans, and it was decided, rather than destroy these birds, to capture some of them and translocate them various distances away from their territory. Surprisingly, most of these individuals returned home very rapidly from distances of up to 25 km. At distances greater than about 40 km, however, very few found their way back. This suggests that, although the birds were not able to navigate home from the longer distances, they were familiar with a much larger area, with a radius of up to about 25 km from home, amounting to nearly 2000 km^2. Jones and colleagues propose that even territorial birds travel outside their territory much more than had previously been thought, perhaps when investigating opportunities for extra-group copulations or looking for a better position in a territory than the one currently held.

The most mobile of the cracticids are the currawongs, especially the Pied Currawong, although the analysis of seasonal Atlas data does not reveal any evidence of large-scale movement. For the Pied Currawong, only the nominate race and the subspecies *nebulosa* of eastern and south-eastern Australia are well known. In south-east Australia, this species maintains breeding territories but, for the rest of the year, forms mobile flocks that move around a local area. Most of the information on its movements is anecdotal, and relates to the species' appearance or disappearance and its increase or decrease in numbers at certain times of the year. Some of the birds in these mobile flocks may be locally resident, whereas others may be altitudinal migrants which have moved to lowland inland or coastal areas from breeding grounds in the highland forests of south-east and east Australia. There is some evidence that the breeding adults remain in their highland areas, while it is the non-breeders and immatures that move to the lowlands. In New South Wales, J. R. Farrell's study of marked



*There is no information on the incubation period of the **Black Butcherbird**, but it is thought to be similar to that of the Pied Butcherbird* (Cracticus nigrogularis), *at 19–21 days. On hatching, butcherbirds may be naked, or covered with sparse down. For the first week, the breeding female broods the nestlings almost continuously. The male, and sometimes helpers from the group, deliver food to her, which she feeds to the chicks. When the nestlings have acquired a covering of feathers, she is able to leave the nest to forage, and the male and helpers then deliver food directly to the nestlings. Helpers may or may not be related to the brood they are feeding, and the benefit they derive from their behaviour is not yet understood.*

[*Cracticus quoyi rufescens*, Cardwell, N Queensland, Australia. Photo: Clifford Frith]

birds in the Blue Mountains, west of Sydney, clearly uncovered altitudinal migration, with immatures the most mobile. In lowland areas throughout their range, Pied Currawongs are considered to be resident, often with an influx of visitors in the autumn–winter period. Large flocks move out to feeding areas from communal roosts, and break up during the day into feeding parties, before coming together as they begin to move back to the roosting areas. A study by J. L. Readshaw of marked individuals in southern New South Wales and northern Victoria showed a regular southward shift in spring, to the south-eastern mountain forests, and a northward one in autumn, with a maximum distance of 320 km. With increased human populations in several towns and cities, for example Canberra, Sydney and Armidale, as well as the maturing of suitable nesting trees and food-bearing shrubs in many of the gardens in these expanding cities, Pied Currawongs which were once autumn and winter visitors are now remaining all year round, with a mixture of breeding and non-breeding individuals.

From pooled data on over 10,000 Pied Currawongs that had been ringed, 40, or 2·3%, were recovered more than 100 km from the ringing site, with a maximum distance of 360 km. In contrast, only eight of more than 16,000 Australian Magpies were recovered more than 100 km from the site at which they had been ringed.

Movements of the Black and Grey Currawongs are not so well known. In the case of the Black Currawong of Tasmania, some individuals are resident and others appear to be partial altitudinal migrants, leaving highland areas after breeding and appearing at lowland sites in the autumn and winter, when they can even turn up in gardens in Hobart. Highland areas of Tasmania are cold and wet or snowy in winter, and many other bird species leave the island altogether in the winter, migrating north to mainland Australia. The relatively few ringed Black Currawongs do not provide much information, because, of the 611 individuals concerned, only 96 were recaught, all within 10 km of the ringing site, and the chance of recovery of any that may have moved is very low. One marked bird was found dead 50 km away, and another was seen alive 3 km from the ringing site more than twelve years later. The subspecies *colei* and *parvior* on King Island and Flinders Island, in Bass Strait, are certainly resident.

Of the three *Strepera* species, the Grey Currawong is the one most generally considered to be sedentary. Even so, some populations in south-eastern Australia and Tasmania may undertake local or altitudinal movements, being present at some times and not at others, although it is not always clear whether this is due simply to seasonal differences in habitat use. Of 754 Grey Currawongs ringed, 126 were recovered, many several times; of 498 recoveries, all except two were at sites less than 10 km from the original ringing site, a good indication of their sedentary nature. One marked individual was recaptured at its ringing site 19 years later.

Relationship with Man

All of the cracticids with the exception of the two species of *Peltops* are relatively large passerines, confident and bold, which have adapted well to living with man and can become very tame. Butcherbirds, with their "perch and pounce" foraging, and the ground-foraging Australian Magpie have benefited from the clearing of forests for farming and grazing and from urban expansion. The Australian Magpie is one of the bird species which persist in cleared agricultural lands, nesting in the shade trees left for sheep or cattle and feeding on open pasture. Provided that enough substantial trees remain for nesting purposes, the older suburbs of large cities, with established parks, playing fields and gardens with shrubs, lawns and well-grown trees, are a mosaic of magpie and butcherbird territories.

The Australian Magpie, because of its wide geographical range, large size, terrestrial foraging in open areas, recognizable melodious song and propensity to become tame, is probably one of the best-known bird species in Australia. It is popular if the local group is a friendly one, but some groups are feared for their aggressive nest defence towards strangers. Almost everyone in Australia has a "magpie story". In suburban areas where magpies live, the territory of a pair or group of these birds probably encompasses several gardens, some of the owners of which are sufficiently interested in birds to put out food for them. Very soon, the magpies arrive at least once a day, scavenging around outdoor cooking areas, and gathering at the door while performing a

loud carolling chorus (see Voice) until food is provided. Many become tame enough to enter a house if a door is open; some groups are fortunate in having more than one provider of cheese or minced meat, or perhaps a place where a pet dog or cat is fed outdoors. In many areas, Pied or Grey Butcherbirds likewise come to be fed, becoming very tame.

Where Pied Currawongs now live in towns and cities throughout the year, they, too, can become tame, and readily visit feeders and picnic tables. Since they do not remain all year in a territory, however, there is not the same element of "ownership" on either side.

Australian Magpies, Pied Currawongs and Grey Butcherbirds, in particular, have in the past been regarded as agricultural pests, causing damage through their depredations of small fruit such as grapes and strawberries, and corn. In recent times, however, their value as predators of insects has come to be seen to be more important. Magpies are effective predators of in-ground insects, particularly beetles, but they also take grasshoppers and locusts (Acrididae) in significant numbers. In their natural forest habitats, currawongs prey on many of the insects that damage eucalypt foliage, and are regarded by foresters as being beneficial.

As well as positive relationships with man, most cracticid species are considered to have some negative features. In the case of the Pied Currawong, it is its role as a nest predator, particularly of small passerines, that is regarded as adverse. Observations at nests of Pied Currawongs showed that the parents fed significant numbers of small birds to their own nestlings; most of these prey were nestlings of House Sparrows (*Passer domesticus*) and Spotted Doves (*Streptopelia chinensis*), both introduced species, but some were of native honeyeater species. It is this perceived role in the disappearance of smaller passerines, particularly in urban and semi-rural areas, that has produced a long debate on whether Pied Currawongs should be culled. Moreover, studies of the nominate race of Gould's Petrel (*Pterodroma leucoptera*), which breeds only on Cabbage Tree Island, 1·4 km off the New South Wales coast, found predation by Pied Currawongs to be a significant cause of mortality in both adults and nestlings of this globally threatened petrel, the breeding success of which increased immediately from 20% to 60% after the currawongs were controlled. In this instance Pied Currawongs were the critical predator, but in most cases many other nest predators, including butcherbirds, are also involved.

So far as the Australian Magpie is concerned, its negative image is a result of its aggressive nest-defence behaviour. Each year in the breeding season, one reads newspaper reports of cyclists sprouting "Martian" antennae on their bicycle helmets, and more serious accounts from all parts of Australia of eye injuries to children who have been subject to magpie attack. The problem is analysed in detail by Jones in his book *Magpie Alert*, based on research by himself and colleagues on a significant human/wildlife conflict. Attacks usually begin with loud alarm and rally calls from the birds as a human intruder is detected near the nest tree. The first part of the attack is a swoop from behind, no contact being made with the intruder; this may be followed by closer swooping, when the magpie flies rapidly towards the head of the victim, from behind or from the side, with calling, loud bill-snaps, pecking and biting. Occasionally, more violent attacks occur, when the bird flies into the face or the chest of the human intruder, holds on with its claws, and pecks at whatever it can reach. Attacks are almost all confined to the period of the breeding season, and almost all are carried out by males close to the nest tree. The frequency of attacks increases during the incubation and nestling stages, but, once the young fledge, the attacks cease as the birds move away from the nest tree. Most Australian Magpies, however, are not aggressive towards humans, and, in the races living in large groups, very often only one of the males attacks the intruder. Further research on attacking magpies found that they were frequently selective, some individuals attacking only pedestrians, some only cyclists, and some only mail-deliverers.

The two most significant types of direct damage caused to humans by Australian Magpies are eye injuries and injuries to cyclists who fall off their bicycles. In Brisbane, 4–13 cases of eye injury are reported each year; repeated across the towns and cities of Australia, that indicates a serious situation. With better understanding of the problem, in particular the timing and the short duration of the attack period, it has become possible to manage it in ways that do not involve the shooting of the pair or group or the destruction of nests; these methods include bicycle helmets, helmets with extra projections or antennae, tall flexible rear poles fixed to bicycles, and, for pedestrians large hats or umbrellas.

Magpie attacks occur only in urban areas. In parks and playing fields, warning notices advising pedestrians to avoid the areas



Young butcherbirds remain in the nest for 25–30 days, though towards the end of that time they may leave the nest for short periods and sit in nearby branches. By the time they leave the nest all cracticids have acquired their juvenile plumage. They are unable to fly properly for 2–3 more weeks, and spend their time skulking in cover, on the ground, or on low branches. Like other cracticids, ***Black Butcherbirds*** *are very aggressive in defence of their nests and fledglings. In the Cape York region of NE Australia, the Trumpet Manucode* (Manucodia keraudrenii) *often nests close to this species, apparently taking advantage of its aggression against predators.*

[*Cracticus quoyi rufescens*, Cairns, Queensland, Australia. Photo: Atsushi Matsui]



Fledgling ***Pied Butcherbirds*** *are fed by group-members for at least a month after leaving the nest. In one study, all the young stayed with the group until they were nearly two years old. At the commencement of the breeding season, some then dispersed to join other groups. Social play among juveniles has not been studied in this species, but is likely to be similar to that of the Australian Magpie* (Cracticus tibicen). *Much of the play involves mock fighting, simulating the attacks and chases that will later be used in territorial and anti-predator defence, and the wrestling that helps establish dominance hierarchies within the group.*

[*Cracticus nigrogularis nigrogularis*, Hattah-Kulkyne National Park, NW Victoria, Australia. Photo: David Stowe]

for the few weeks of the breeding season can be effective. It should be remembered, too, that many reported magpie attacks are in fact carried out by butcherbirds, and it seems that, to many members of the public, one aggressive black-and-white "missile" looks much the same as another.

Status and Conservation

Of the twelve species in the family Cracticidae, eleven are currently considered not to be at any immediate risk. The twelfth is a Data-deficient species. This is the Tagula Butcherbird, which occurs only on the small island of Tagula, in the Louisiade Archipelago, off the coast of south-east New Guinea. It is possibly conspecific with the Hooded Butcherbird, but its biology and status on Tagula are little known, although its habitat has been degraded and heavily logged. Its geographical restriction to a single small island with a total area of about 866 km² does, however, suggest that it may warrant treatment as Near-threatened, if not Vulnerable. The forest of the eastern two-thirds of Tagula is already degraded, and logging remains a threat to all of the lowland forest. Indeed, uncontrolled and illegal logging in New Guinea and subsequent habitat degradation are widespread, affecting all species, whether threatened or not, and it will require a major political effort to rectify this situation.

Information about the Tagula Butcherbird's status would be a first step towards its conservation. Although its population and ecology are virtually unknown, as are those of most of the island's other endemic species, they are likely to be similar to those of the Hooded Butcherbird, which is a common and adaptable species, occurring in all forest-edge habitats, including gardens and savanna. Proposed conservation measures for the Tagula Butcherbird include surveys of potentially suitable habitat on the island and study of its ecological requirements, tolerance of habitat degradation and threats. The forests from Mount Riu eastwards are very important for the survival both of this species and of the endemic Tagula Honeyeater (*Meliphaga vicina*). Ten Tagula Butcherbirds were seen during a ten-day trek from the north coast up to Mount Riu in 1992, on the only recent visit to the island by ornithologists.

Although the eleven remaining species are not globally threatened, consideration of the 42 taxa covered by them reveals four which give cause for significant concern. Three of these are subspecies which, like the Tagula Butcherbird, occur on small islands and are therefore restricted in range and in population size. The subspecies *hercules* of the Hooded Butcherbird is found only in the Trobriand Islands and the D'Entrecasteaux Archipelago, at the south-eastern tip of New Guinea; although reported in 1970 as common on Goodenough Island, in the D'Entrecasteaux Group, despite the destructive agricultural methods used by the local residents, it is now restricted to just a few relatively small islands, and its future must be considered uncertain. Detailed surveys to determine its current status are a necessary step towards its conservation.

Two subspecies of the Pied Currawong are listed by Garnett and Crowley in their *Action Plan for Australian Birds*. These authors considered the population of the race *crissalis*, found only on Lord Howe Island, about 600 km north-east of Sydney, as stable but "endangered", estimated at 80 breeding individuals in an area of 12 km². A survey of the birds of Lord Howe Island, published in 2004, lists *crissalis* as rare, and suggests that molecular investigation of its relationship with the nominate race is warranted because of its long isolation, to determine whether it is a distinct species. Garnett and Crowley's recommendations for conservation action are for continued monitoring of the population by wildlife authorities, and to ensure that human residents on the island are aware of the significance of the subspecies, both biologically and commercially. Tourism is a major industry on Lord Howe Island, and visits by birdwatchers are a significant component of this. In addition, they list the mainland Victoria race *ashbyi* as "critically endangered" on the basis of its decreasing population size and range, but they stress that this is a precautionary assessment as a result of lack of information. No "pure" population of *ashbyi*, one without intermediate individuals (see Systematics), is at present known. Any efforts at conservation of this race depend on mapping the location of populations with individuals attributable to *ashbyi*, and the clear determination of morphological and genetic differences between *ashbyi* of west Victoria and *nebulosa* of east Victoria. Only then might it be possible to identify habitat barriers that could be used to prevent *ashbyi* from being overrun by *nebulosa*, if it is not already too late.

Another island currawong, the King Island race *colei* of the Black Currawong, is listed as "vulnerable" by Garnett and



The main brood parasite of the cracticids is the Channel-billed Cuckoo (Scythrops novaehollandiae), *here being fed by a* ***Pied Currawong***. *Currawongs attack adult cuckoos on sight, often going well outside the normal boundaries of their territory. One group of Pied Currawongs, which usually set upon intruders when they came within 40 m of the nest, attacked Channel-billed Cuckoos 80 m away. There are also records of butcherbirds being parasitized by the Common Koel* (Eudynamys scolopacea). *Intraspecific brood parasitism, in which the brooding female is not the mother of one or more young in her nest, has been found to be frequent among cracticids. Annual variation in nest success can be considerable. On average, 50–70% of Australian Magpie* (Cracticus tibicen) *nests produce at least one fledgling, while 59% of fledgling Pied Butcherbirds* (C. nigrogularis) *survive to one year, and at least 82% of yearlings survive to two years. For Australian Magpies over two years old, annual survival was 92%. Many groups of this species contain individuals over ten years old, and the oldest known Australian Magpie was at least 15. Groups led by these dominant older birds can be extremely stable, and are maintained by the retention of progeny, while being constantly refreshed by high levels of extra-group copulation.*

[*Strepera graculina*, New South Wales, Australia.
Photo: Neil Bowman/FLPA]

Crowley, on the grounds that it has only one population, of about 500 individuals, in an area of 500 km². The Tasmanian mainland and Flinders Island subspecies are thought not to be at any risk. At present, the King Island population is stable, but continued monitoring is necessary, as the expansion of the beef-cattle and dairy industries on the island is increasing demands for further clearing of the forest habitat.

The Black Butcherbird is widely distributed, with five subspecies in New Guinea and Australia. The recently described race *alecto* is found in southern New Guinea and includes birds found on the Australian islands of Boigu and Saibai, in the northernmost Torres Strait close to the New Guinea coast. Garnett and Crowley rated this race as "near-threatened", although it would be "vulnerable" on the basis of its small Australian range, limited to two islands with a combined area of 100 km². The islands are close to New Guinea, and there is likely to be genetic exchange, hence the downgrading of its threat status. Boigu and Saibai represent only a small part of the larger range of *alecto*, and are probably not of significance to the subspecies as a whole, but only in an Australian context. There appear to be no immediate threats to these populations, except perhaps the effects on low islands of rising sea levels for birds that live in mangrove habitat. It was suggested that birds such as the subspecies *alecto* of the Black Butcherbird could be used as a means of encouraging visits by birdwatchers, who would then contribute to the monitoring of habitats and numbers.

Apart from the Tagula Butcherbird, no New Guinea taxon in the Cracticidae is considered threatened or nearly so, and their status is insufficiently known for any realistic assessment of their true conservation status to be made. The two species in the genus *Peltops* are still poorly known, although both are widespread within that large island. The Lowland Peltops is perhaps more at risk, because of the extensive logging of the lowland rainforest that it occupies. This is likely to lead to a decrease in the extent of the species' occurrence and also in its population. The Highland Peltops appears to be even less known, there being few data on its breeding biology and little information on its population levels. Both species are assumed not to be threatened, but further fieldwork is required.

The main potential threat to all New Guinea taxa is likely to be the large-scale clearing of lowland and foothill forest for timber and wood chips. Owing to much illegal logging, the area cleared each year is greater than that allowed under permits granted. Butcherbirds are well known for their ability to co-exist with man, and in New Guinea they use the openings created by village gardens, but large-scale clearance of forest does not create suitable habitat. A further problem is the lack of information for West Papua (Irian Jaya), where the extent of recent clearing for timber and mining is not well documented. Even the information generated by bird tourism is sparse. Tourists are few in the west of New Guinea, and the high level of lawlessness in the east, Papua New Guinea, discourages many potential visitors, and restricts the travel of those who do make the trip.

For all cracticids, whatever their conservation status, habitat loss through land-clearing and fire is still a threat in New Guinea and parts of Australia. In Australia, the problems of drought, fire, introduced predators, and habitat degradation by grazing stock are significant everywhere, and regular monitoring is necessary in order to ensure that population levels remain stable, rather than declining. In times of drought, grazing pressure on understorey vegetation in uncleared timbered areas of private land and broad roadside reserves can be severe, removing the litter layer which sustains the insects and small vertebrates that are the basic food of butcherbirds and currawongs. The large-scale surveys involving amateur birdwatchers that have produced the first and second Atlases of Australian birds, in 1984 and 2003, respectively, provide some information on population trends, but they do not satisfy the need for detailed studies of individual species, especially those presumed to be at risk. Thus, in the Cracticidae, only the common and widespread Australian Magpie has been well studied, but the basic biology of butcherbirds and currawongs is in general poorly known, so that it is hard to identify those features of their life-cycle that make them vulnerable to threatening processes.

*The **Black Currawong** is a restricted-range species, confined to the Tasmania Endemic Bird Area. In spite of its rather limited distribution, it is relatively common in general, and its populations are mostly thought to be fairly stable. However, the race* colei, *of nearby King Island, is considered to be at risk, with a population of only about 500 individuals occurring in an area of 500 km².*

[*Strepera fuliginosa fuliginosa*, Tasmania. Photo: Jiri Lochman/ Lochman Transparencies]



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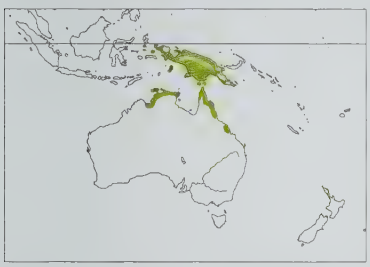
Genus *CRACTICUS* Vieillot, 1816

1. Black Butcherbird

Cracticus quoyi

French: Cassican des mangroves **German**: Mangrovemetzgervogel **Spanish**: Verdugo Negro
Other common names: Spalding/Rufous/Brown/Quoy Butcherbird, Black/Rufous Crow-shrike

Taxonomy. *Barita Quoyi* Lesson and Garnot, 1827, Dorey (= Manokwari), Vogelkop, north-west New Guinea.
Has at times been placed in a monotypic genus, *Melloria*. DNA evidence suggests that this species may be more closely related to *C. tibicen* than to others of genus, but more evidence needed. Race *jardini* intergrades with *rufescens* in region of Endeavour R (in NE Queensland). Geographical variation slight; some authors consider that species would be better treated as monotypic. Five subspecies currently recognized.
Subspecies and Distribution.
C. q. quoyi (Lesson & Garnot, 1827) – West Papuan Is (Waigeo, Salawati and Misool), Yapen (in Geelvink Bay) and mainland New Guinea (except Trans-Fly).
C. q. alecto Schodde & Mason, 1999 – SC New Guinea (Trans-Fly region from Princess Marianne Strait E to Daru I), Aru Is, and islands in N Torres Strait (Boigu and Saibai).
C. q. spaldingi Masters, 1878 – N Western Australia (Cambridge Gulf) E along coast, including Tiwi Is (Bathurst I and Melville I), to coastal Arnhem Land (to Blue Mud Bay, in Gulf of Carpentaria).
C. q. jardini Mathews, 1912 – coastal Cape York Peninsula S to Mitchell R in W and to Cooktown in E.
C. q. rufescens De Vis, 1883 – NE coastal Queensland from Cooktown area S to N Broad Sound (S of Mackay), with gap at Burdekin R.



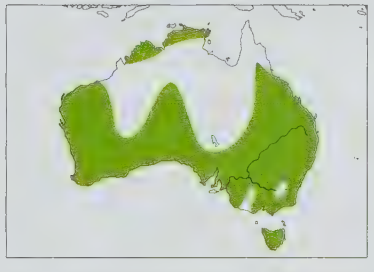
Descriptive notes. 33–44 cm; 148–196 g (races unspecified), 180–220 g (*spaldingi*). Large, all-dark butcherbird with massive hook-tipped bill. Nominate race is black, brighter glossy blue-black on back, duller ventrally, and becoming duller with wear; tail long, appears square-tipped at rest but rounded in flight; iris brown; bill blue-grey or milky blue, distal third black; legs dark grey or black. Sexes similar in plumage, male (wing 180 mm) slightly larger than female (wing 176 mm). Juvenile differs from adult in having underparts dull black or brownish-black, iris brownish-yellow, bill pale grey, legs dark grey; immature like adult, but underbody and most of upperwing duller black-brown, contrasting with glossy head, neck and back, area of bluish colour at base of bill becoming more extensive with age. Races differ mainly in size and in bill morphology: *alecto* is larger than nominate (wing of male 190 mm, of female 181 mm), intermediate in size between following two, immature dull black; *spaldingi* is largest race (42–44 cm; wing of male 198 mm, of female 186 mm), with slender bill, immature dull black; *jardini* is smaller than previous (167 g; wing of male 181 mm, of female 176 mm), with short, slender bill, immature dull black; *rufescens* is smaller than last (33–38 cm; male 161 g; wing of male 174 mm, of female 166 mm), with short, slender bill, immature either rufous-brown or dull black (sometimes both types in same brood). Voice. Repertoire not well known; regional variation reported, but not well characterized. Vocalizations loud. Song a rich, melodious yodelling with some clear liquid notes, sometimes (e.g. dawn in breeding season) given in long bouts. Antiphonal duets by presumed males and female, especially at start of breeding season. In early morning, male gives clonking "gronk, gronk" call from perch in canopy.
Habitat. Nominate race occurs in most forest types and plantations in lowlands and hills, to c. 1300 m. In S New Guinea and N & NE Australia, mainly mangrove forests and riverine vegetation along humid coasts, also coastal rainforest and adjacent woodland, including open grassy woodland.
Food and Feeding. Invertebrates, mainly insects; also small vertebrates, e.g. small lizards and snakes, frogs, small mammals and birds (including nestlings), small crabs and fish; also some fruit. Sometimes feeds by pouncing to the ground, but in forest forages mostly at 8–30 m through subcanopy and lower canopy; also searches through litter. In mangroves, forages below canopy on trunks, branches, prop-roots and ground. Prey items too large to be eaten in one piece are wedged into a crack or fork or impaled on a spike, and then dismembered.
Breeding. Little known. Laying in middle to late dry season Aug to early Jan (mainly Sept–Oct) in New Guinea; eggs mainly Sept–Jan (mostly Oct–Nov) in Australia. Territorial, remaining on territory all year. Nest an untidy bowl of sticks and twigs, may be lined with rootlets and grass, one was 25 cm in diameter and 8 cm deep; in Australia placed in vertical fork 5–15 m above ground, or (in Western Australia) at 5–7 m in vertical fork of tall mangrove and often overhanging tidal creek; frequently in same area, although not same tree, each year; in NE Australia (Cape York) Trumpet Manucode (*Manucodia keraudrenii*) often breeds in vicinity of nest of present species, apparently benefiting from its aggressive nest defence. Clutch 2–4 eggs, usually 3; colour variable, cream to greyish-green, olive-grey or greyish-blue, with rich reddish-brown or darker dots, spots and blotches concentrated at larger end, dimensions c. 33 × 24 mm; no information on incubation and nestling periods.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Common and widespread in much of New Guinea; fairly common in Australia. Reported density of 3 birds/10 ha in rainforest near Port Moresby, in SE New Guinea. Australian population of race *alecto* rated nationally "Vulnerable" because of very small area of occupancy (islands of Boigu and Saibai, total area 100 km²); same race occurs also in S New Guinea and Aru Is. Main threat to Australian population of *alecto* is rising sea levels. Main potential threat to nominate race in New Guinea is logging of lowland rainforest habitat; for races on tropical coasts of N Australia, frequent fires lead to modification of grassy woodland habitats.
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2. Grey Butcherbird

Cracticus torquatus

French: Cassican à collier **German**: Graurücken-Metzgervogel **Spanish**: Verdugo Acollarado
Other common names: Australian/Collared/White-winged (Grey) Butcherbird, Collared Crow-shrike, Clouded/Grey Shrike; Silver-backed Butcherbird (*argenteus* and *colletti*); Tasmanian Butcherbird (*cinereus*)

Taxonomy. *L[anius] torquatus* Latham, 1801, coastal south-east Australia.
This species and *C. mentalis*, which form a superspecies, have sometimes been placed in a separate genus, *Bulestes*. Races *argenteus* and *colletti* sometimes treated as a separate species, geographically separated from other races by significant desert barriers, and possibly at least as close to *C. mentalis* as to present species; *argenteus* shares some characters with present species and others with *C. mentalis*; further study, including molecular analysis, required in order to resolve true relationships. Race *colletti* often included within *argenteus*, but seems reasonably distinctive. Nominate race intergrades with *leucopterus* on W slopes of Great Dividing Range from S Queensland S to Otway Range, in Victoria. Proposed race *latens* (Uwins I, in N Western Australia) is a synonym of *argenteus*. Type locality of taxon *argenteus* is disputed; if this name is instead applicable to Arnhem Land form, Western Australian form then takes name *latens*. Five subspecies recognized.
Subspecies and Distribution.
C. t. argenteus Gould, 1841 – Western Australia (Kimberley region E from Yampi Sound and mouth of Fitzroy R) and marginally NW Northern Territory (E to mouth of Victoria R), S to Great Sandy Desert.
C. t. colletti Mathews, 1912 – coastal Northern Territory from Victoria R almost to E tip of Arnhem Land, S to N Tanami Desert in W.
C. t. leucopterus Gould, 1848 – S half of Australia S of 20° S (except for desert areas of Western Australia, South Australia, Northern Territory and W half of Queensland), in E extending N in E Queensland (W of Great Dividing Range) towards S Cape York Peninsula.
C. t. torquatus (Latham, 1801) – coastal SE Queensland S (mainly E & S of Great Dividing Range) to Victoria.
C. t. cinereus (Gould, 1837) – Tasmania.



Descriptive notes. 27–30 cm; 68–99 g, 112 g (male *cinereus*). Medium-sized butcherbird having strong bill with sharp terminal hook. Male nominate race has top and side of head black, sharply separated from bright white chin and throat, broad white half-collar on each side from throat towards middle of hindneck (the two sides not meeting), conspicuous white spot on lores; upperparts dark grey with some streaking and mottling, narrow white band across rump (prominent in flight); uppertail black with narrow white tip (tip usually abraded); upperwing mostly black, narrow white stripe through innermost secondaries, white patch in secondary coverts (visible in flight); underparts off-white, grey shading over breast, flanks and belly; underwing whitish, merging into brown on flight-feathers, undertail black or silver-grey with broader white tip; iris dark brown; bill pale blue-grey at base, sharp transition to black distal third to half; legs dark grey. Female is smaller than male, plumage variable, like male or variously with head duller brownish, back duller grey, loral spot off-white and larger (meeting eye), less white in wing, undertail always silver-grey (may be black on male). Juvenile is generally brown with buff streaks, head dark brown, streaked buff, throat off-white, loral spot, eyebrow and collar buff-white, upperbody dark brown with fine buff streaks, wing brown with buff stripe, underparts buff-white with diffuse dark brown streaking on breast and flanks, bill blackish, shorter, stubbier and less hooked than adult's; immature similar to adult, but head noticeably duller black or black-brown with buff streaks, buff eyebrow, collar dull off-white, upperparts duller and browner with lighter mottling (sometimes grey, similar to adult), underparts streaky brown-white, bill dull grey. Race *leucopterus* has longer tail than nominate, back lighter mid-grey, broader white band on rump, wider white stripe in wing, broader white tip of tail, male underbody white with faint grey bloom, female light cloudy grey; *cinereus* is larger and darker, with longer wing and tarsus, head greyish-black, back dull grey or brownish-grey; *argenteus* differs from nominate in having completely black head (no white on lores), black chin, front lower edges of hood extending as black "necklace" on to breast, paler silvery-grey back, scapulars and rump with darker shaft streaks, broader white tail tip, more extensive white patch in wing; *colletti* is similar to previous but smaller, with chin and side of breast white, no necklace, shorter white tail tip. Voice. Nominate race well studied. Three main song types: Territorial Song, heard all year, especially before dawn and in evening, given by male and female and any other group-members, as duet or group song, complex, vigorous, loud chortling containing both musical and harsh elements; Breeding Song, given Aug–Nov in breeding season, before dawn, by male, no harsh elements, each male has several versions each composed of a number of phrases with a series of simple elements, rising, falling, steady and warbling; Whisper Song (or Subsong), heard most of year, less in breeding season, usually in middle of day; given by male from special perch, soft, audible to 10–30 m, contains elements of Territorial and Breeding Songs, also mimicry of other birds, frequently given in long bouts (exceeding one hour). Other sounds include harsh "keerk" alarm calls, shrill distress calls, bill-snapping, begging calls by female in course of sexual behaviour or by fledglings when food-begging; also variety of soft warbling vocalizations at roosting or when feeding young in nest. Voice of *argenteus* and *colletti* little known, but that of former considered significantly different from that of nominate; recordings of *colletti* contain unhurried phrases of mellow ringing notes more like song of *C. quoyi* and *C. cassicus* than of present species; also some faster jumbled phrases like those of nominate race.
Habitat. Range of open habitats, mainly eucalypt (*Eucalyptus*) open forests and woodlands, including mallee woodlands and *Acacia* shrublands and woodlands, preferring open ground layer of

On following pages: 3. Black-backed Butcherbird (*Cracticus mentalis*); 4. Pied Butcherbird (*Cracticus nigrogularis*); 5. Hooded Butcherbird (*Cracticus cassicus*); 6. Tagula Butcherbird (*Cracticus louisiadensis*); 7. Australian Magpie (*Cracticus tibicen*); 8. Pied Currawong (*Strepera graculina*); 9. Black Currawong (*Strepera fuliginosa*); 10. Grey Currawong (*Strepera versicolor*); 11. Lowland Peltops (*Peltops blainvillii*); 12. Highland Peltops (*Peltops montanus*).

grass or scattered shrubs; also on farms, in rural towns and in parts of larger cities with well-grown trees in parks and gardens. In N of Western Australia and Northern Territory (races *argenteus* and *colletti*) mainly in riparian forest, especially of cadjeput (*Melaleuca leucadendra*), vine scrub, edges of rainforest patches, thickets at foot of cliffs, fringing vegetation such as pandanus (*Pandanus*) along creeks and rivers, forest and woodland in gorges and gulleys.

Food and Feeding. Invertebrates, mainly insects, also small vertebrates, especially small birds and nestlings; some fruit and seeds, and nectar. Forages from perch, pouncing on prey on ground, sallying to seize insects on branches or trunks of trees, or striking for flying prey such as bees (Apidae) or cicadas (Cicadidae). Reported as chasing small birds in flight, but more often seizes from behind small birds which are foraging on ground, killing them by powerful spear of bill to the head; association with mixed-species foraging flocks interpreted as a strategy to prey on other birds. Also robs nests of small birds. Prey too large to be eaten whole usually wedged in fork or impaled on thorn or twig and torn into edible fragments; surplus food cached in such sites. Seen drinking from ground pools and tree hollows. In Northern Territory, race *colletti* one of a number of opportunist nectar-feeders when nectar very abundant in dry season.

Breeding. Laying generally from early Aug to Jan (mostly Sept–Oct), but breeding recorded in all months, probably in response to rain in arid and semi-arid areas; laying Aug–Sept (end of dry season) in NW of range (race *argenteus*). Nests usually in simple pairs, sometimes with a helper, usually immature from previous year. Territorial; present in territory all year. Nest built by both sexes (reportedly lined only by female), a shallow, open untidy bowl c. 20 cm in diameter, external depth c. 10 cm, constructed mostly with thin twigs, neat internal cup c. 5 cm deep and lined with grass, rootlets, hair and other fine pliable materials, usually placed 2–12 m (mostly c. 5–6 m) above ground in horizontal or vertical fork in tree, usually living, most in eucalypt, some in *Acacia*, *Banksia*, cypress-pine (*Callitris*) or other native or introduced tree, often sapling used; in NW of range (*argenteus*) an untidy small bowl 18–23 cm across and 8–11 cm deep, internally 8·5–9 cm wide and 3–3·5 cm deep, of fine twigs, lined with spinifex grass and rootlets, usually in vertical or horizontal fork 5–15 m above ground in tree, including *Melaleuca leucadendra* and *Eucalyptus miniata*. Clutch usually 3–4 eggs, variable in colour, brownish-green with red, purple or brown spots, usually concentrated at large end, mean 32 × 23 mm, in NW of range (*argenteus*) 2–3 eggs, pale olive-grey or buff-brown, zone of reddish-brown spots and blotches on violet-grey at larger end, 29 × 21 mm; no information on incubation and nestling periods and post-fledging parental care of NW races; elsewhere, incubation by female alone, period c. 21 days; chicks fed by both parents, also by helper if present, nestling period 25–26 days; adults very aggressive towards intruders at nest; young fed by parents for at least one month after fledging, one record of male feeding fledglings from first nest while female built new nest; some immatures disperse after breeding season, but many remain with parents until start of next breeding season, and a few remain for at least part of breeding season and help to defend territory and to feed nestlings.

Movements. Sedentary. Many anecdotal reports of seasonal movements probably refer to post-breeding dispersal of immatures, but no detailed studies. Censuses in open forest near Darwin (Northern Territory) showed numbers of race *colletti* similar in wet and dry seasons, suggesting that birds remain in same area all year.

Status and Conservation. Not globally threatened. Generally rather uncommon and patchily distributed; more common in Tasmania. In some areas, numbers have declined because of clearing of open woodland habitats for urban development or for agriculture, as in wheat-growing area of Western Australia; in other areas, forest clearance has produced the more open habitats preferred by this species. Can co-exist with man, as suburban trees and parks mature to provide suitable habitat. Can become very tame and is often encouraged by householders, who enjoy its delightful song. In N Australia, main future threats are habitat alteration and loss resulting from current fire regimes and the possibility of a shift to more intensive agriculture in face of decreasing rainfall in S Australia owing to climate change. Current practice of yearly burning in late summer prevents regeneration of trees and leads to replacement of low grassy understorey with tall dense grasses unfavourable to butcherbirds.

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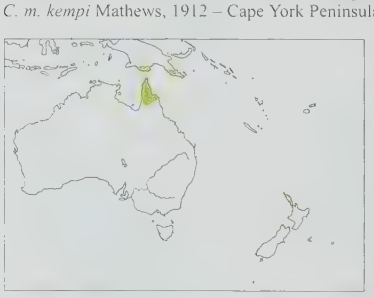
3. Black-backed Butcherbird

Cracticus mentalis

French: Cassican à dos noir **Spanish**: Verdugo Dorsinegro
German: Schwarzrücken-Metzgervogel
Other common names: White-throated Butcherbird

Taxonomy. *Cracticus mentalis* Salvadori and D'Albertis, 1876. Nicura, south-east New Guinea.
This species and *C. torquatus*, which form a superspecies, have sometimes been placed in a separate genus, *Bulestes*. Two subspecies recognized.

Subspecies and Distribution.
C. m. mentalis Salvadori & D'Albertis, 1876 – S New Guinea in S Trans-Fly region (Merauke E to Balimo) and SE peninsula (Hall Sound E to Kupiano and inland to Sogeri Plateau).
C. m. kempi Mathews, 1912 – Cape York Peninsula, in NE Australia.



Descriptive notes. 25–28 cm; c. 74–100 g. Small white-throated pied butcherbird with hook-tipped strong bill. Nominate race has top and side of head and neck black, sharply demarcated white chin and throat, some black on chin at base of bill; black upperparts separated from black of head by white collar (broken in centre of upper mantle), rump grey; tail black with white tip; upperwing black, much white on scapulars and innermost secondaries, forming a long white band on folded wing, largely white primary coverts and some white at base of primaries together forming a patch on outer wing (seen from above in flight, black area of back separated from black and white outer wing by wide white band); entire underside white; iris brown; bill pale blue-grey with dark tip; legs black. Sexes similar. Juvenile has plumage pattern similar to that of adult, but black areas are dark brown, hood and mantle with buff streaks, underparts brown-tinged; immature similar to adult, but black areas duller, tinged brown, and some juvenile plumage in wings and tail. Race *kempi* smaller than nominate, with shorter wing, tail and bill, and narrower black region on back. Voice. Not well known. Song described as unhurried phrases of long and short, mellow ringing notes at low and medium pitches, interspersed with disyllabic yodels and croaks, somewhat similar to jumbled rollicking yodel of *C. torquatus* and *C. cassicus* but more languid, and unlike fluting song of *C. nigrogularis*; said to be an accomplished mimic. May sing antiphonal duets. Other vocalizations include explosive, rapidly repeated loud calls, "kya, kya, kya".

Habitat. Tropical savanna woodlands and open forest, generally dominated by eucalypts (*Eucalyptus*), also in paperbark (*Melaleuca*) woodland; prefers short grassy understorey. Occurs also in plantations, gardens and rural towns. In New Guinea, found in lowlands and foothills, to 600 m (on Sogeri Plateau).

Food and Feeding. Chiefly insects, with small vertebrates (e.g. lizards), some seeds. In New Guinea, recorded as killing a Sacred Kingfisher (*Todiramphus sanctus*) and attempting to take fledgling Willie Wagtails (*Rhipidura leucophrys*). Feeds by pouncing and snatching, often after perching motionless for long period; forages also by moving slowly through canopy, gleaning and snatching. Few observations of feeding in Australia.

Breeding. Not well known; most information from New Guinea (nominate race). Territorial; present in territory all year. Laying Aug–Apr, from middle of dry season to middle of wet season, with most nests Oct–Dec; sometimes two broods. Nest built by female alone, a shallow bowl of sticks, lined with pliable stems of creepers and rootlets, placed usually 10–20 m above ground, sometimes much higher, in fork of tree. Clutch 2–3 eggs, usually 3, greyish-brown, spotted and blotched with reddish-brown in irregular ring at larger end, c. 29 × 22 mm; incubation probably by female alone, fed on nest by male, period c. 3 weeks; chicks fed by both parents, nestling period reported as c. 2 weeks; parents defend nest very aggressively.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Rather uncommon to locally common, and restricted in distribution. The common butcherbird of Port Moresby, in SE New Guinea. Reported density near Port Moresby 2·5 birds/10 ha. Can co-exist with man in rural towns and cattle stations in Australia and plantations and gardens in New Guinea. Savanna habitat in Australia now subject to frequent fires, causing habitat change; few new young trees survive to replace old ones, and this species' preferred low grassy understorey is replaced with either tall grass or woody weeds.

Bibliography. Amadon (1951), Barnard (1911), Barrett *et al.* (2003), Beehler *et al.* (1986), Bell (1970c), Beruldsen (2004), Blakers *et al.* (1984), Christidis & Boles (2008), Coates (1990), Coates & Peckover (2001), Halliday (1987), Higgins *et al.* (2006a), Mayr & Rand (1937), Mees (1982), Pizzey *et al.* (2007), Rand (1942a), Rand & Gilliard (1967), Schodde & Mason (1999), Simpson & Day (2004), Storr (1953), Tubb (1945), White (1911, 1922).

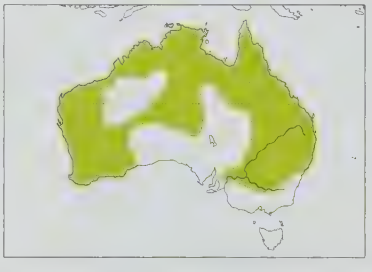
4. Pied Butcherbird

Cracticus nigrogularis

French: Cassican à gorge noire **Spanish**: Verdugo Gorjinegro
German: Schwarzkehl-Metzgervogel
Other common names: Black-throated Butcherbird, (Black-throated) Crow-shrike

Taxonomy. *Vanga nigrogularis* Gould, 1837, New South Wales, Australia.
Forms a superspecies with *C. cassicus* and *C. louisiadensis*. Races intergrade in N Queensland (SC Cape York Peninsula S to upper Georgina R and Diamantina R). Geographical variation partly clinal in W (race *picatus*), with gradual decrease in size from S to N; birds from W & C Australia sometimes recognized as race *kalgoorli* (described from Kalgoorlie, in S Western Australia), but probably part of this cline. Two subspecies recognized.

Subspecies and Distribution.
C. n. picatus Gould, 1848 – N & W Australia E to NW Queensland, S (except in main desert areas) to S Western Australia and NW South Australia.
C. n. nigrogularis (Gould, 1837) – E Australia from N, C & E Queensland S to E South Australia and N Victoria (Murray R).



Descriptive notes. 28–32 cm; 105–159 g. Fairly large butcherbird with strongly hook-tipped robust bill. Nominate race has black head, neck and upper breast forming distinctive hood, sharply divided from white collar and underbody; moderately broad dull white collar between hindneck and black "saddle", black grading into pale grey band on rump, adjoining broad white band on uppertail-coverts; tail black with broad white tip (above and below), white widest at edges; upperwing black, broad white band from point of shoulder (in flight, shows as white band between black back and black outer half of wing), white on innermost secondaries, inner greater coverts black, central ones white (or black and white), outer ones black, often with small white central tip, central median coverts white, outer ones black and white, small white patch on primaries at leading edge of outer wing; iris reddish-brown or dark brown; bill pale blue-grey, distal third black; legs dark grey. Female is similar to adult male, or differs in having head and saddle duller black or blackish-brown, collar narrower and tinged grey, smaller white patch on primaries (differences slight, most obvious if sexes seen together). Juvenile is similar to adult in plumage pattern but browner, with paler eyebrow, no collar, upper breast buff, underparts dirty off-white, bill brownish; immature brownish or buff where adult black, similar to juvenile, beginning to show signs of pale collar at sides of buff bib, underparts clean white, basal half of bill progressively more bluish-grey. Race *picatus* differs from nominate in having much broader, bright white collar and rump, narrow black area on back and little grey on rump, female with broad dull white collar, bill relatively longer than nominate, also S populations much larger than nominate. Voice. The most beautiful song within family of accomplished singers. Three main song types: Territorial or Day Song, heard all year, throughout day, as solos, antiphonal duets and choruses, a slow progression of extended flute-like notes, repeated, sometimes changing in pitch with either sharp break or sliding change (as if a flute-player were improvising slowly almost at random), in antiphonal duet each bird sings a series of notes (the two individuals at different pitches); Breeding Song, probably only by male, in breeding season, at daybreak and at night, in short bouts of 6–7 seconds over 10–20 minutes; Whisper Song (or Subsong) may occur in long bouts, up to 45 minutes, and accomplished mimicry of many other birds and other sounds may be included. Also gives variety of alarm calls, said to differ according to the type of threat.

Habitat. Open forests and woodlands, mainly eucalypts (*Eucalyptus*) or *Acacia*, with open shrubby or grassy understorey; also shrubland with some trees, and in N mainly in riverine habitats with riparian forests of paperbark (*Melaleuca*), casuarina (*Casuarina*), eucalypts, pandanus (*Pandanus*) and other trees. Also in modified habitats, farmlands, parks and gardens and playing fields with open grassy areas and mature trees.

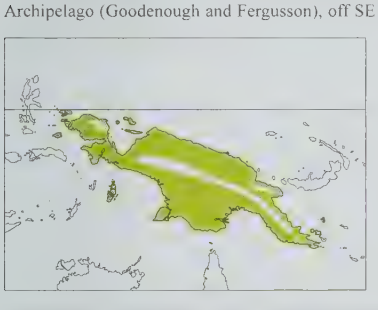
Food and Feeding. Invertebrates, mainly insects; also small vertebrates; some seeds, fruit and nectar. No detailed studies of feeding behaviour. Forages largely on ground, pouncing from vantage point in tree or other elevated perch; also sallies from perch to chase flying insects. Wedges items into crevice or on to spike (such as twig or barbed wire) while dismembering it; may also cache food in such places.
Breeding. Laying in Aug–Dec (mostly Sept–Oct), occasionally also at other times, especially in more arid areas with unseasonal rainfall. Normally in group of 3–15 individuals (most frequently six), those other than breeding pair generally being young of previous years, most groups having only one breeding female (in a few cases a second female attempts to breed, but rarely successful); lives all year in territory of 13–22 ha, defended by all group-members; evidence of extra-group matings, and intra-group brood parasitism whereby female other than nest-owner lays in nest. Nest built by female, a deep, untidy open bowl of twigs and sticks, lined with rootlets, strips of bark and grass, fur and feathers, external dimensions 20–30 cm wide × 6–14 cm deep, internally 10·5–12·5 × 4–6·5 cm, usually 3–15 m above ground in vertical fork of tree towards outer edge of canopy and well shaded by foliage above, trees used dependent on habitat, include eucalypt, *Corymbia*, *Acacia*, casuarina, *Grevillea* and *Bauhinia*; new nest built for replacement or repeat clutch. Clutch 2–4 eggs, variable in colour, olive to brown, buff, grey or green, spots or blotches of brown, reddish-brown, blackish-brown, mixed with black dots, concentrated at larger end, 33 × 24 mm (nominate), 31 × 22 mm (*picatus*); incubation by female alone, period c. 19–21 days; chicks brooded by female alone, fed by female and some or all of other group-members, nestling period c. 30 days; fledglings fed by group-members for at least one month, many remain with group for several years, some disperse after about two years and join other groups. Records of brood parasitism by Pallid Cuckoo (*Cuculus pallidus*) and Channel-billed Cuckoo (*Scythrops novaehollandiae*).
Movements. Sedentary.
Status and Conservation. Not globally threatened. Locally common; rare in arid SW corner of Queensland and in NW New South Wales. In some areas, e.g. near Darwin (N Northern Territory), numbers have declined because of urban expansion. In SW Australia, has extended its range following clearance of forest for agriculture. Can co-exist with man near farms and in suburban areas with mature trees and extensive parks and gardens. Often becomes very tame and is fed and encouraged by residents, in part for the sake of its superb song.
Bibliography. Amadon (1951, 1962c), Anon. (1926), Barrett *et al.* (2003), Beruldsen (2004), Blakers *et al.* (1984), Brooker & Brooker (1989), Christidis & Boles (2008), Courtney & Marchant (1971), Donato & Potts (2004a), Franklin (1999), Hall (1974), Higgins *et al.* (2006a), Johnstone & Storr (2004), Jurisevic & Sanderson (1994), Lumsdaine (1996), McCarthy (2006), Mees (1961, 1964b), Pizzey *et al.* (2007), Plowright (2006), Robinson (1994), Saunders & Ingram (1995), Schodde & Mason (1999), Simpson & Day (2004), Slater *et al.* (2003), Storr (1991).

5. Hooded Butcherbird

Cracticus cassicus

French: Cassican à tête noire **German**: Papuametzgervogel **Spanish**: Verdugo Cabecinegro
Other common names: Black-and-white/Black-headed/Black-backed(!)/Pied Butcherbird(!)

Taxonomy. *Ramphastos cassicus* Boddaert, 1783, New Guinea.
Forms a superspecies with *C. nigrogularis* and *C. louisiadensis*; possibly conspecific with latter. Two subspecies recognized.
Subspecies and Distribution.
C. c. cassicus (Boddaert, 1783) – West Papuan Is, New Guinea and satellite islands (except those off SE coast), and Aru Is.
C. c. hercules Mayr, 1940 – Trobriand Is (Kailuna, Kiriwana and Kitawa) and D'Entrecasteaux Archipelago (Goodenough and Fergusson), off SE New Guinea.



Descriptive notes. 32–35 cm; 130–155 g. Rather large butcherbird with black head and throat, and strong bill slightly hooked at tip. Nominate race has head and neck down to upper breast black; mantle and back variable, black, mottled or largely white depending on amount of white edging on black feathers (possibly varies with age), rump and uppertail-coverts white; upperwing black, conspicuous white patch formed by variable amount of white on upperwing-coverts and tertials; tail black, outer rectrices with white tips; underparts below upper breast white; iris dark brown or black; bill pale bluish-grey or milky blue, black tip; legs black. Sexes similar in plumage, male larger than female. Juvenile has black feathers of head, breast, back and wing-coverts tipped brown; bill grey. Race *hercules* is similar in plumage to nominate, but larger (wing 185 mm; nominate 170 mm). Voice. One of finest singers in family, but not studied in detail. Song described as loud jumble of bugling and yodelling, containing bell-like notes and liquid and rollicking phrases, with hoarse croaks, gurgles and musical notes, these varied phrases combined into songs which last for up to 6 seconds; bout of singing can last for several minutes, and include repetition of several different songs; song can include mimicry of other birds, including birds-of-paradise (Paradisaeidae), nominate race of Little Shrike-thrush (*Colluricincla megarhyncha*), Rusty Pitohui (*Pitohui ferrugineus*), Spangled Drongo (*Dicrurus bracteatus*) and Helmeted Friarbird (*Philemon buceroides*).
Habitat. Lowland forest and dense second growth, often near human habitation, to c. 650 m. Occurs in openings in rainforest, forest edge and gardens.
Food and Feeding. Feeds on large insects, larvae, spiders (Araneae) and fruit; also takes small vertebrates, including birds. Forages mostly in crowns of trees bordering open spaces. Usually in pairs or in small groups.
Breeding. Not well known. Many single records of nests suggest that breeding may occur at any time, with preference for late dry season. Reported that several pairs may nest close together quite amicably; one report of several adults feeding one nestling. Nest a bulky bowl of sticks and twigs, built 9–25 m above ground towards end of strong lateral branch of tree. Clutch 2–3 eggs, pale olive, tinged with brown, blue or green, with faint blotches of brown and some darker brown spots at larger end, c. 33 × 25 mm. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Widespread and common. Although present throughout most of New Guinea, and able to live in areas of human habitation, extensive logging of lowland rainforest is likely to lead to decreases in size and extent of populations. Race *hercules* restricted to mostly very small islands, has tiny overall range; also likely to be suffering the effects of logging.
Bibliography. Beehler *et al.* (1986), Bell (1970c), Coates (1990), Coates & Peckover (2001), Diamond (1972), Mayr (1940), Mayr & Rand (1937), Peckover & Filewood (1976), Rand (1942a, 1942b), Rand & Gilliard (1967), Ripley (1964), Schodde & Hitchcock (1968), Tubb (1945), Watson *et al.* (1962).

6. Tagula Butcherbird

Cracticus louisiadensis

French: Cassican de Tagula **German**: Louisiadenmetzgervogel **Spanish**: Verdugo de Tagula
Other common names: Louisiade/Sudest/White-rumped Butcherbird

Taxonomy. *Cracticus louisiadensis* Tristram, 1889, Sudest Island = Tagula Island, Louisiade Archipelago, New Guinea.
Forms a superspecies with *C. nigrogularis* and *C. cassicus*; possibly conspecific with latter. Monotypic.
Distribution. Tagula I, in Louisiade Archipelago, off SE New Guinea.



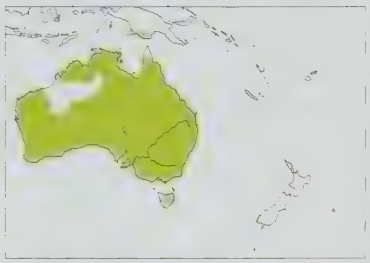
Descriptive notes. 27–30 cm. Rather large, dark butcherbird with powerful hook-tipped bill. Plumage is all black, except for white spots at sides of breast, white stripe on inner wing (formed by two partly white tertials), white uppertail-coverts, large white spots at tips of outer tail feathers, white lower abdomen, undertail-coverts and inner wing-coverts; iris dark brown; bill grey-blue, tip black; legs black. Sexes similar in plumage, male larger than female. Juvenile undescribed. Voice. No information.
Habitat. Forest and forest edge.
Food and Feeding. No information.
Breeding. No information.
Movements. Probably sedentary.
Status and Conservation. Data-deficient. Restricted-range species: present in Louisiade Archipelago EBA. Very poorly known. Ten were seen on the only fairly recent visit to island, during a ten-day trek from N coast up to Mt Riu in 1992. Forest of E two-thirds of Tagula (total area c. 866 km²) already degraded, and logging presumably remains a threat to all lowland forest. Population and ecology of present species virtually unknown, but thought likely to be similar to those of *C. cassicus*, a common and adaptable species occurring in all forest-edge habitats (including gardens and savanna). No current conservation measures known; proposed measures include surveys of potentially suitable habitat on Tagula and study of the species' ecological requirements, tolerance of habitat degradation and threats. Forests E from Mt Riu very important for survival of both the present species and the endemic Tagula Honeyeater (*Meliphaga vicina*).
Bibliography. Anon. (2008n), Beehler (1993), Beehler *et al.* (1986), Butchart & Stattersfield (2004), Coates (1990), Peckover & Filewood (1976), Rand & Gilliard (1967), Stattersfield & Capper (2000).

7. Australian Magpie

Cracticus tibicen

French: Cassican flûteur **German**: Flötenvogel **Spanish**: Verdugo Flautista
Other common names: Australasian Magpie, Piping Crow-shrike; Black-backed Magpie (*longirostris*, *terraereginae*, *eylandtensis*, *tibicen*); New Guinea Magpie (*papuanus*); Western Magpie, Varied Crow-shrike (*dorsalis*); White-backed Magpie/Crow-shrike (*tyrannicus*, *telonocua*, *hypoleucus*)

Taxonomy. *C*[*oracias*] *tibicen* Latham, 1801, New South Wales, Australia.
Often placed in a monotypic genus, *Gymnorhina*, partly on basis of adaptations for terrestrial foraging; inclusion in present genus supported by molecular studies. Races fall into three groups, the "black-backed group" (*longirostris*, *terraereginae*, *eylandtensis* and nominate) of NW, N & E Australia, the "white-backed group" (*tyrannicus*, *telonocua* and *hypoleucus*) of SE Australia and Tasmania, and the "western or varied group" (*dorsalis*) of SW Australia, the last possibly including *papuanus* of New Guinea; groups were formerly treated as representing three distinct species, but little congruence found between morphological variation and genetic variation. Races intergrade extensively: *eylandtensis* intergrades with *terraereginae* in C & S Northern Territory and NW Queensland, and latter race intergrades with all others (*tibicen*, *tyrannicus*, *telonocua*) where ranges meet; in SC Australia confusing intergradation involving *telonocua*, *terraereginae*, *tyrannicus* and *eylandtensis*; and *dorsalis* intergrades with *longirostris* over broad region of S Western Australia from Shark Bay E to SW edge of Great Victoria Desert. Proposed race *finki* (described from Horseshoe Bend, on Finke R, in Northern Territory) refers to an intergrading population between *eylandtensis* and presumably *terraereginae*; *leuconotus* (from South Australia) likewise relates to an intergrade. With so much complex intergradation and often only differences in size between races, recognition of so many races perhaps inappropriate; further study of differences between populations, including molecular-genetic analyses, is required. Nine subspecies provisionally recognized.
Subspecies and Distribution.
C. t. papuanus (Bangs & J. L. Peters, 1926) – S New Guinea (S Trans-Fly region from Princess Marianne Strait E to Oriomo R).
C. t. eylandtensis (H. L. White, 1922) – N Western Australia (Kimberley region) E through Northern Territory (including Groote Eylandt) to NW Queensland.
C. t. longirostris (Milligan, 1903) – Western Australia from Dampier Land S at least to Pilbara region (inland extent uncertain).
C. t. dorsalis (A. J. Campbell, 1895) – SW Western Australia (E almost to Eucla, S of Great Victoria Desert).
C. t. telonocua (Schodde & Mason, 1999) – S Northern Territory and South Australia.
C. t. terraereginae Mathews, 1912 – most of Queensland (except Gulf region and extreme SE) and New South Wales W of Great Dividing Range (including most of Murray–Darling basin) S to E South Australia (S, E of L Eyre, to Murray R) and N Victoria.
C. t. tibicen (Latham, 1801) – coastal SE Australia.
C. t. tyrannicus (Schodde & Mason, 1999) – N & E Victoria (mostly E of Great Dividing Range).
C. t. hypoleucus Gould, 1837 – E half of Tasmania.
Race *tyrannicus* introduced on King I (in W Bass Strait) and New Zealand (North I and South I); *hypoleucus* introduced on Flinders I (in E Bass Strait); nominate and *hypoleucus* (and possibly *tyrannicus*) introduced in Fiji.
Descriptive notes. 37–43 cm; c. 210–360 g (races combined), 212–325 g (*terraereginae*), 265–360 g (*dorsalis*), c. 300 g (nominate). Large black-and-white cracticid with long, heavy bill slightly hooked at tip, tail relatively short and square-ended, thighs feathered, long legs with large strong feet; wings long, broad at base, with pointed tip. Male nominate race is mostly glossy black, with



large areas of bright white on nape and back of head, rump, and most of uppertail except for black band c. 5 cm wide at tip; white vent and undertail-coverts; white secondary coverts forming large white shoulder patch, white primary coverts forming smaller patch at leading edge of folded wing; iris red-brown; bill bluish-white with black tip, area of white becoming more extensive with age; legs black. Female is like male, but white on back of head merges to light grey on collar and rump. Juvenile is like female in pattern, but plumage loose and fluffy, main colour mottled blackish-brown with buff or greyish-brown barring, smaller white areas in wing, flight-feathers brownish, has buff eyebrow, bill shorter and grey-black, pinkish gape, iris brown, legs grey-black; immature variable, some like adult female but less glossy, others more like juvenile with buff or greyish-brown streaking and barring and with pale fluffy plumage on belly, retains juvenile wings and tail and, sometimes, buff eyebrow, quickly loses pink gape, and bill may develop some white at base during first year, iris dark brown; in second year similar to adult female, but bill still not fully white. Race *terraereginae* is almost identical to nominate, but smaller, with shorter wing, tail and tarsus, and relatively longer bill, black tail tip narrower, some feathers on thighs may have white tips; *longirostris* has longer, more slender bill than previous, but plumage very similar except for white feathers on thighs; *eylandtensis* is small, with long slender bill, basic pattern similar to nominate except that black band across back of male much narrower (more white on back), thighs white or black; *tyrannicus* is very large with relatively short bill, male similar in pattern to nominate except that whole back is white, black tail tip very broad, thighs black, female and second-year immature like adult male but back milky grey with black streaks and white feather edging, back of head white, juvenile like that of nominate but back brownish-grey, barred black, with buff mottling; *hypoleucus* is very similar to last but smaller, with shorter wing, tail, bill and tarsus, black thighs, narrower tailband; *telonocua* is very similar to *tyrannicus* but smaller, and black tip to tail narrower, female has whitish patch on back of head and hindneck less extensive; *dorsalis* male is similar to preceding three races, but smaller than *tyrannicus*, with short black tip on tail, female wings, tail and underparts as for male, back of head and hindneck white, often blurred or scaled with grey, back black with narrow white feather fringes (giving scalloped effect), amount of white on back variable (little sign of white on some, on others white fringes broad and scalloping very obvious), juvenile similar to nominate except for buff fringes on back (scalloped appearance), first-year bird has back feathers dull black with variable white fringes, underside mottled grey, feathers darker-centred with paler fringe of light grey with buff tinge, especially on throat and chin (can be quite rufous), second-year has back black, variously scalloped white, underparts mottled, somewhat blacker than first-year, some have glossy black throat and upper breast, fully adult in fourth or fifth year; *papuanus* has dorsal pattern similar to previous, male white-backed (sometimes some black on mantle), female black-backed with white-edged feathers and grey rump, both with white feathers on thighs, juvenile more or less as nominate but brown tips on black back feathers, immature and subadult like adult female. Voice. Said to vary with locality and race. One of finest, best-known songbirds in Australia, with varied and complex repertoire. Well-known Carolling a series of loud, melodious flute-like yodelling calls, usually by pair or group, started by a senior male or female, others (including immatures) joining in, often performed on ground; used for advertising and defending territory, in border disputes or just as advertisement; given also when significant food source encountered. Warble Song (Subsong) by single individual from high but well-concealed songperch, a soft warbling incorporating mimicry, continuing for long periods (up to one hour), containing elements heard in Carolling but at lower intensity. Other warbling songs are Dusk Song, Dawn Song and Moonlight Song, the last two heard early morning and on moonlight nights before and during breeding season, singers probably males; gives many repetitions of a short phrase, for long periods. Wide range of alarm calls based on harsh "ka" sound at various intensities. Rally Call a loud descending whistle of two or three syllables, "hoo hoo hooooo", audible over long distance, serves to summon group-members to boundary dispute or to attack by predator. Nestlings and fledglings give loud insistent begging call at sight of adult with food.

Habitat. Open habitats with low ground cover such as grasses. Originally inhabited open eucalypt (*Eucalyptus*) woodlands, now found also in farmland and urban areas that provide open areas of grassland with mature trees nearby. Occurs in remnant vegetation patches, homestead trees, shelter-belts and windbreaks, along roads and rivers, also on edges of forest or woodland adjacent to farmland; in urban areas common in large parks, vegetation reserves and older suburbs with large gardens, lawns and well-grown trees. Not common in dense forests or pine (*Pinus*) plantations, except at edges and where large internal open areas present. Introduced population in New Zealand exhibits preference for open farmland with scattered trees.

Food and Feeding. Invertebrates, especially terrestrial insects; also small vertebrates, including frogs, lizards, small birds and small mammals. Will eat carrion if available, or take insects present on a carcass. Forages in groups, members of which spread out over quite a large area, rather than feeding close together. Feeds mainly on ground, by gleaning surface or probing with long bill; turns over litter, leaves and stones, also stands at base of trees and probes into loose bark on trunks. Walks slowly across foraging area, looking for prey on surface; can also hear subsurface prey, and probes for beetles (Coleoptera) in soil following auditory cues. Smaller prey consumed immediately; larger items held, shaken and bashed against ground, or may be held with feet and torn apart. Seen to cache food.

Breeding. Eggs recorded Jun–Mar (most laid Aug–Dec) in Australia, timing can vary with location and season, especially in N and inland areas with irregular rainfall; in New Zealand (introduced) eggs recorded Jul–Nov; female occasionally attempts second brood when group available to look after first brood. Breeds as pair or in group, maintaining territory throughout year; in urban area single territory can occupy several gardens, and in natural vegetation or farmland territory size varies with quality, c. 4–10 ha. Breeding system varries geographically (main difference is group size); in N & E Australia (races *terraereginae* and nominate best known) breeding unit a pair, and group includes only pair and immatures up to about one year; in S Australia (*tyrannicus* and *dorsalis* best known) group size larger, not all young disperse, breeding group includes multiple adult males, more than one adult breeding female, non-breeding adult males and females and older immatures; co-operative breeding recorded in some populations; some females in multi-female groups build nest and rear chicks with no assistance from other group-members until nestlings fledge. Evidence of high level of extra-group copulation; in urban population of *dorsalis*, more than 80% of nestlings were sired by extra-group males. Nest built by female alone, over period of 2–3 weeks, an untidy flattened bowl of sticks and twigs, with (in farmland and urban areas) fencing wire and coloured electrical cable often incorporated, inner cup lined with grass, hair, wool and shredded bark, external diameter c. 30–50 cm and depth 10–20 cm, internal diameter 13–16 cm and depth 5–10 cm; usually in vertical or horizontal fork in tall tree, in outer canopy of live tree, 2–20 m (average c. 10 m) above ground, eucalypt preferred if available, but in urban areas exotic trees also used; female frequently nests in same tree each year or in nearby one; in multi-female groups individual females may nest in adjacent trees. Clutch usually 3–4 eggs, blue or green with red-brown spots, blotches or streaks, average 38 × 27 mm; may lay replacement clutch if first nest attempt fails (unless failure very late in season); incubation by female alone, period c. 21 days; chicks brooded by female, fed by female, her male partner, and in some cases other group-members, nestling period c. 30 days; young out of nest initially unable to fly, spend time on ground, in low cover or in lower branches of tree, into which they clamber by hopping, can fly after 2–3 weeks, mother provides most food for first month, then young begin to forage independently, but continue to beg from mother or other adult (and may receive food occasionally) for up to six months, although largely independent by two months; in large groups fledglings may be fed by other group-members, in addition to mother and her male partner; some groups defend nest and fledglings very aggressively by diving at intruders, especially during late nestling stage; in small groups (only one pair breeding) young remain until dispersing at start of next breeding season, in larger groups young remain longer and many do not disperse; female may disperse when reaching sexual maturity at 2 years or may remain and breed in natal group; males may disperse in third year or some time later, but many do not. Nests parasitized by Channel-billed Cuckoo (*Scythrops novaehollandiae*), sometimes by Common Koel (*Eudynamys scolopacea*). Success varies with year and location, overall c. 70% of nests produce fledged young and pairs produce c. 1 fledgling per nest; in larger groups in Western Australia over ten years, groups with 1–5 breeding females produced 1·7 fledglings per group; main causes of failure are predation by crows (*Corvus*) and bad weather, especially rain and high winds when nests contain large nestlings.

Movements. Primarily sedentary. Non-breeding flocks formed by some races are more mobile within local areas, roosting several kilometres from feeding locations. Occasional long-distance movements of ringed individuals recorded, but no indication that such movement is frequent. Most dispersal only between local territorial groups, e.g. young male or female moving to nearby group that has vacancy. Race *hypoleucus* of drier E half of Tasmania, occasionally occurs in forests of NW and SW.

Status and Conservation. Not globally threatened. Generally common and widespread. Locally abundant in E Australia; less numerous in N & C parts. Fairly common in New Guinea. Has benefited from creation of more open grassy habitat by clearance of native vegetation for farmland and urban expansion. Able to thrive in towns and cities, where tall trees for nesting and roosting and grassy expanses for foraging meet its needs; moreover, most pairs or groups in urban areas are fed by at least one of the human residents whose garden they visit, and this food helps to maintain breeding success in poor seasons. No major threats to Australian races; in New Guinea, *papuanus* has very restricted range. Does not occur in rainforest habitat subject to logging, but could suffer from effects of fire, hunting, and overpopulation by humans.

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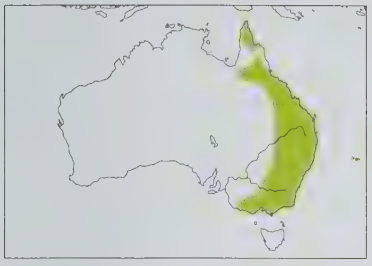
Genus *STREPERA* Lesson, 1831

8. **Pied Currawong**

Strepera graculina

French: Grand Réveilleur **German**: Weißbürzel-Würgerkrähe **Spanish**: Verdugo Pío
Other common names: Scrub Currawong, (Pied) Bell-magpie, Pied Crow-shrike, Black/Mountain Magpie

Taxonomy. *Corvus Graculinus* Shaw, 1790, Sydney region, New South Wales, Australia.
Forms a superspecies with *S. fuliginosa*; sometimes considered conspecific, but differs in vocalizations. Geographical variation on mainland to some extent clinal, with general increase in size, decrease in bill size, greyer (less black) plumage, and decreasing white in wing and tail from N to S. Race *nebulosa* intergrades with nominate in N (from Mudgee S to Eden, in SE New South Wales) and with *ashbyi* in SW (W Victoria), possibly completely overlapping latter race (especially in Grampian Range), and continued existence of "pure" *ashbyi* individuals uncertain. Described race *grampianensis* (from Grampian Range, in W Victoria) based on juvenile specimen from intergrade zone; *riordani* (from near Geelong, in W Victoria) likewise an intergrade form. Six subspecies currently recognized.
Subspecies and Distribution.
S. g. magnirostris H. L. White, 1923 – E Cape York Peninsula S to about Laura (N Queensland), in NE Australia.
S. g. robinsoni Mathews, 1912 – coastal ranges of N Queensland on E slopes of Great Dividing Range (from Cooktown S to Ingham).
S. g. graculina (Shaw, 1790) – E Queensland (from Clarke Range, just S of Bowen) S, inland to W slopes of Great Dividing Range, to Blue Mts and SE New South Wales.
S. g. nebulosa Schodde & Mason, 1999 – SE New South Wales tablelands and E Victoria.
S. g. ashbyi Mathews, 1913 – S half of W Victoria (especially in Grampian Range) W of line between Ballarat and Cape Otway.
S. g. crissalis Sharpe, 1877 – Lord Howe I and offshore islands (including Admiralty Group).
Descriptive notes. 44–50 cm; male 259–385 g, female 243–324 g. Large, black passerine, like a *Corvus* crow but more slender, with long legs, long, heavy, slightly hook-tipped pointed bill forming almost straight line with flattened head top; long tail with rounded tip, long wings rather narrow,



with prominent "fingers". Nominate race is largely black (plumage appears browner when worn); prominent large white patch on wing formed by white bases of most primaries (patch crescent-shaped in flight), conspicuous white rump, broad base and tip of tail (above and below) and undertail-coverts; iris bright yellow; bill black; legs dark grey or black. Sexes similar in plumage, male slightly larger than female. Juvenile is similar to adult, but black areas brown, darker on back and wings, buff tips of wing-coverts forming wingbar, smaller white primary patch, lighter on belly with some streaking, bill with pale tip, gape yellow, iris dark brown; immature darker than juvenile, mainly blackish above (some with brown tinge), browner below (may have some streaking), buff wingbar contrasts with brown wings, primary patch small as on juvenile, yellow gape persists for about six months, iris yellow. Race *magnirostris* is of about same size as nominate, has short tail and massive bill, white wing patch larger and white tail base more extensive than nominate, narrow white tail tip; *robinsoni* is smaller than nominate, with short tail and short bill, white wing patch larger and white tail base more extensive, narrow white tail tip; *nebulosa* is larger than nominate, with long tail and short bill, back sooty black, sooty below, slate-grey belly, white wing patch and white tail base less extensive than nominate, broad white tail tip; *ashbyi* is similar to nominate in size, but with longer tail and shorter bill, back dark slate-grey, sooty below, slate-grey belly, white wing patch much smaller, white tail base very narrow (concealed by tail-coverts), white tail tip broad; *crissalis* is smaller than nominate, with proportionately long tail and bill, white wing patch small, white tail base and tail tip narrower than nominate. Voice. Most commonly heard call a loud ringing "curra-wong, curra-wong" (the Currawong Call), of two or three syllables, may vary with region or race, e.g. as "currah-currah-currong"; given in flight, when perched, advertising territory, chasing intruder, in presence of predator, and in communication with mate. Also harsh scolding alarm, and soft chittering calls in solicitation preceding copulation; food-begging call by female on nest similar to that of juvenile. Other calls made occasionally, but context not clear. Breeding Song different from other currawong sounds, heard only in breeding season, rendered as "ow-ooo, ow-ooo" or "kwee, koo-wee", repeated in phrases two or three times, and the sequence repeated in a series of short bouts before sunrise.

Habitat. Mainly eucalypt (*Eucalyptus*) forest and woodland; prefers older forest for breeding. N races also in rainforest; on Lord Howe I (race *crissalis*) in tall palm forest or rainforest. Widespread in E & SE mainland Australia in settled areas, farmland, country towns and parts of cities with parks, gardens and remnant areas of native vegetation.

Food and Feeding. Omnivorous; eats wide variety of fruit, seeds, insects and small vertebrates; also snails (Gastropoda). Most food collected by gleaning on ground and among foliage for insects and fruit. In winter, large flocks congregate at native and introduced trees and shrubs, feeding on such fruit such as lilly pilly (*Acmena smithii*), Moreton Bay fig (*Ficus macrophylla*) and various species of *Pyracantha* and *Ligustrum*. Observed to attack free-flying small birds, and to take eggs and chicks from nests, particularly when feeding own nestlings. Larger prey thrashed against hard object before eaten or fed to young; snail shells broken against rocks and flesh removed.

Breeding. Not well known. Season generally Aug–Dec in SE Australia. Breeds as pair, in territory established and maintained during breeding season. Most nest-building by female, over period of 10–14 days, with some help from male, nest an untidy outer framework 28–37 cm in diameter, of sticks and twigs, neat inner cup 15 cm in diameter and c. 5 cm deep, lined with dry grass, strips of fibrous bark and fine roots, placed in fork near end of outer branch, usually of tall eucalypt, in N Queensland sometimes of paperbark (*Melaleuca leucodendra*), in suburban areas introduced trees, especially pines (*Pinus*) used; often same tree used in successive years. Clutch usually 3–4 eggs, light brown with blotches of darker brown, mean 42–29 mm; incubation by female, may be fed on nest by male, period c. 21 days; chicks brooded by female only, fed by both sexes, nestlings leave nest for short periods after c. 31 days, fledge 1–2 days later. Nest parasitism by Channel-billed Cuckoo (*Scythrops novaehollandiae*) recorded.

Movements. Not well known. Some altitudinal migration, with post-breeding descent to lowlands E & W of Great Dividing Range, especially by immatures and non-breeding individuals; adults more likely resident. In non-breeding season, nominate race moves farther N & W and *nebulosa* disperses N & NW. In many coastal and lowland areas, small resident populations increased by influx in autumn and winter. Ringing studies revealed some movements of c. 300 km.

Status and Conservation. Not globally threatened. Locally common. Most races secure, except for those on Lord Howe I (*crissalis*) and in W Victoria (*ashbyi*). Race *crissalis* assessed variously as "Endangered" and "Vulnerable"; one population of estimated 80 breeding individuals in 18 km². Race *ashbyi* assessed as "Critically Endangered" on a precautionary basis; may already have been swamped by widespread and expanding race *nebulosa*, and no longer extant as a pure taxon. In some towns where this species was once only a non-breeding winter visitor, it is now resident, sustained by garden plantings, e.g. in Rockhampton (Queensland), Sydney and Armidale (New South Wales), Canberra (Australian Capital Territory) and Geelong (Victoria).

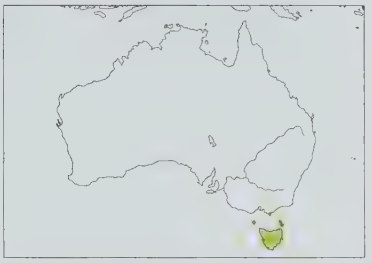
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9. Black Currawong

Strepera fuliginosa

French: Réveilleur noir **German**: Tasmanwürgerkrähe **Spanish**: Verdugo Fuliginoso
Other common names: (Black/Sooty) Bell Magpie, Sooty Currawong/Crow-shrike, Black/Mountain Magpie/Jay

Taxonomy. *Coronica fuliginosa* Gould, 1837, Tasmania, Australia.
Forms a superspecies with *S. graculina*; sometimes considered conspecific, but differs in vocalizations. Three subspecies currently recognized.
Subspecies and Distribution.
S. f. colei Mathews, 1916 – King I, in W Bass Strait.
S. f. parvior Schodde & Mason, 1999 – Furneaux Group, in E Bass Strait.
S. f. fuliginosa (Gould, 1837) – Tasmania.



Descriptive notes. c. 50 cm; male 365–457 g, female 327–353 g. Large, dark passerine resembling a *Corvus* crow, with massive bill slightly hooked at tip and pronounced curve on upper mandible, flattened head top; long tail with rounded tip, long broad wings with "fingered" tips. Nominate race is almost entirely black (becomes browner with wear), white area at base of primaries forming white wingbar on underwing (and sometimes visible on upperwing), flight-feathers with white tips (broadest on outer five primaries), tail with rounded white tip; iris bright yellow; bill and legs black. Sexes similar, male larger than female. Juvenile is blackish-brown, streaked on breast, with pale areas of wing and tail off-white, bill greyish-white with pale yellow gape, legs dark grey; iris dull yellow; immature dark brown to black, similar to worn adult, wing and tail pattern as in adult but off-white, retains some juvenile plumage in wings, bill black, pale yellow gape persists into second year, iris yellow. Races differ only in size: *parvior* is smaller than nominate, with proportionately shorter tail; *colei* is smallest, with proportionately shortest tail. Voice. Not well known. Calls described variously as musical "kar-week, kar-week", long drawn-out rolling croak, and incessant chattering scream, possibly all variants of same call. Food-carrying adult gives long flute-like whistle. Soft whistles and croaks between members of pair.

Habitat. In austral summer, inhabits moist mountain forests, especially cool temperate rainforests and wet sclerophyll (*Eucalyptus*) forests; also tableland habitats, e.g. heathlands, moors and sedgelands. In autumn and winter months, at least part of population wanders in flocks to lowland eucalypt forests and woodlands and urban habitats. On islands in Bass Strait lives in drier forested habitats all year, also coastal scrubs and beaches.

Food and Feeding. Mainly insects, and small vertebrates such as lizards, birds and mice; some fruit and seeds. Bass Strait races (*colei* and *parvior*) seen to feed in large numbers among piles of giant kelp (*Macrocystis pyrifera*) on beaches. Usually forages on ground, probing and gleaning and turning over bark and forest litter; will seize small birds in flight. Scavenges at picnic grounds and farmyards. May wedge larger prey in crevice or splintered log and tear off pieces to carry to nest or fledglings. Known to cache food.

Breeding. Little known. Season generally Oct–Dec; nestlings reported in Nov and fledglings in Dec. Breeds as pair. Nest built by both sexes, an untidy outer framework c. 40 cm in diameter, of sticks and twigs, lined with twigs, grass, rootlets and strips of bark, usually placed high in fork of tall forest eucalypt; may refurbish old nest of previous year. Clutch 2–4 eggs, purplish-buff with red-brown and purple blotches, generally at larger end, mean c. 44 × 31 mm; young fed by both parents; strong defence of nest. No other information.

Movements. Not well known. Some descend from cold and snow of upland areas during autumn and winter; others resident. After breeding season, may move in flocks closer to human habitation.

Status and Conservation. Not globally threatened. Restricted-range species: present in Tasmania EBA. Fairly common. King I race (*colei*) assessed as "Vulnerable" in Australia; main threat is clearing of native vegetation for farmland. Species is sometimes regarded as a pest in orchards and around poultry farms.

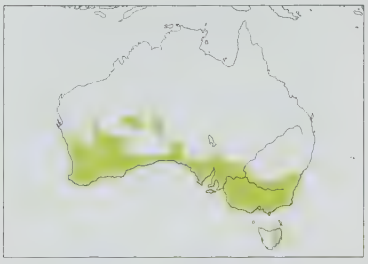
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10. Grey Currawong

Strepera versicolor

French: Réveilleur cendré **German**: Rußwürgerkrähe **Spanish**: Verdugo Cenizo
Other common names: Common Currawong, Grey Bell-magpie/Crow-shrike; Brown Currawong (*intermedia*); Black-winged Currawong (*melanoptera* and *halmaturina*); Clinking Currawong (*arguta*)

Taxonomy. *C[orvus] versicolor* Latham, 1801, Sydney region, New South Wales, Australia.
Races very variable in plumage colour and pattern, and for a long time regarded as forming four separate species, one in SE South Australia (*intermedia*), one in mallee and scrublands of SW New South Wales S to Kangaroo I and extreme NW Victoria (*melanoptera* and *halmaturina*), one in Tasmania (*arguta*), and one covering rest of range (*plumbea* and nominate); races, however, intergrade wherever they come into contact with one another, and better treated as representing a single species. Thus, *melanoptera* intergrades with nominate from South Australia–Victoria border E to Grampian Ranges in N and to Cape Otway in S; possible intergradation of *plumbea* with *intermedia* E through Great Victoria Desert uncertain but likely. Proposed race *howei* (described from Kow Plains, in NW) represents an intergrade population; *centralia* (from Everard Ranges, in NW South Australia) indistinguishable from *plumbea*. Six subspecies currently recognized.
Subspecies and Distribution.
S. v. plumbea Gould, 1846 – from SW Western Australia (S from Geraldton) E, discontinuously, to extreme SW Northern Territory (Petermann Ranges) and W South Australia (Musgrave and Everard Ranges, and in Great Victoria Desert).
S. v. intermedia Sharpe, 1877 – South Australia from Ooldea E along coast (S of Nullarbor Plain) to Yorke Peninsula.
S. v. melanoptera Gould, 1846 – SE South Australia (S Flinders Ranges S to Fleurieu Peninsula and Mt Lofty Ranges) E to mallee areas of NW Victoria.
S. v. halmaturina Mathews, 1912 – Kangaroo I, off South Australia.
S. v. versicolor (Latham, 1801) – SE New South Wales (from Hunter R) S, inland to W slopes of Great Dividing Range, to W Victoria (Grampians and, on coast, to Port Phillip Bay).
S. v. arguta Gould, 1846 – E Tasmania (E of line joining Devonport and Hobart).
Descriptive notes. 44–57 cm; 300–500 g. Large, like a raven (*Corvus*) but more slender, with long, heavy, conical bill only slightly hooked at tip and forming almost straight line with flattened head top; long narrow tail with rounded tip, long and broad wings with distinct white-tipped "fingers". Nominate race is mostly mid-grey, with blackish face, forecrown and throat, white undertail-coverts and tail tip; upperwing appears mostly grey, with white tips of flight-feathers, in flight wings blacker and with conspicuous patch formed by white area across bases of flight-feathers (visible from above and below); iris yellow; bill black; legs dark grey or black. Sexes similar, male larger and darker than female. Juvenile is much browner than adult, with body plumage softer and looser, face and throat not so dark, buff streaks and mottling on head, neck and upper chest, white markings



of wing similar to adult, pale fringes on upperwing-coverts (distinct buff wingbar), bill black with pale yellow tip and paler base of lower mandible, gape yellow, iris light brown; immature like adult, but head, neck, body and tail appear browner, may retain some streaking on throat and upper breast, wing as juvenile, gape remains yellow during first year, iris yellow. Races differ mainly in size, bill shape, colour tone of body plumage, width of pale tail tip, and amount of white in wing: *plumbea* is very like nominate, but plumage slightly darker, and bill tends to be slightly deeper with more decurved upper mandible; *intermedia* is smallest race, bill shape like that of nominate, plumage darker than nominate; *melanoptera* is similar in size and bill shape to nominate, but plumage darker (very like preceding race), slightly less white in tail, upperwing mostly blackish, lacks white tips of flight-feathers and white primary patch (sometimes indistinct greyish at bases of inner webs), wing-coverts darker; *halmaturina* is very similar to previous, but slightly darker, sooty-black, with bill longer and less broad, white on tail tip narrow; *arguta* is larger, longer-billed and much darker than nominate, dark sooty-grey, with faint dull grey tips to remiges and little grey at base of tail, also has large white wing patch, and more white on tail tip. VOICE. Best-known call, uttered in flight, "tew-tew" or "kling-kling" (usually described as the "Clinking Call"), typically of two syllables but often three, the third sometimes prolonged or changing in pitch, reminiscent of sound made by a gong or a hammer striking an anvil; can also give in flight a call similar to the "Curra-wong" of *S. graculina*. Also prolonged whistle-like call, likened to sound of a squeaking gate. Other calls described as like a toy trumpet, mewing of cat, growl and cough, but context not known. Food-begging calls by juveniles and by females in breeding season.

Habitat. Found in temperate forest to arid shrubland habitats. Eucalypt (*Eucalyptus*) forests and woodlands; mallee woodlands and shrublands with spinifex (*Triodia*) as understorey; may occur in farmland near forest, and in exotic pine (*Pinus*) plantations.

Food and Feeding. Omnivorous; no detailed studies. Wide variety of insects; also small vertebrates, including lizards, birds and their nestlings, small mammals; also fruit and seeds. Forages mainly on ground, but also above ground in fruiting shrubs or trees. Uses long strong bill to probe in litter on ground, in crevices and under bark, to turn stones and to split rotting wood. Known to be a nest predator.

Breeding. Little known. Eggs in Jul–Dec, varying with locality; fledglings to mid-Feb. Breeds as pair, in territory maintained all year. Nest built mostly by female, with some assistance from male, a shallow untidy bowl c. 36–46 cm in diameter, made with sticks, inner cup of grass, plant fibre, fine twigs and rootlets, usually placed high in tall eucalypt, often in fork at end of long branch in outer canopy. Clutch usually 2–3 eggs, colour variable, pinkish-buff or purplish-buff to brown, with dark brown, red-brown and lilac-grey spots and blotches, mostly at larger end, mean c. 44 × 30 mm; incubation by female alone, fed on nest by male, period c. 23 days; chicks fed by both sexes, leave nest at c. 32 days, remain with parents until next breeding season. One record of nest parasitism by Channel-billed Cuckoo (*Scythrops novaehollandiae*).

Movements. Sedentary at many sites. In Tasmania and highland areas of SE Australia, some possibly descend to lower altitudes in autumn–winter period, augmenting resident populations, but large flocks are not seen and apparent increase in numbers may simply be the effect of local birds foraging in more visible locations. In Tasmania, few records in higher-rainfall, heavily forested areas W of main range.

Status and Conservation. Not globally threatened. Locally common to uncommon. Has evidently declined throughout range. In Western Australia, range of race *plumbea* has decreased with clearing of forests and woodlands for farming; this race assessed as "Critically Endangered" in Northern Territory, with no sightings since 1960s; has been suggested that other populations of *plumbea* in C Australia and inland Western Australia have become rare and that the race is of conservation concern. Species is sometimes regarded as a pest in orchards.

Bibliography. Amadon (1951, 1962c), Anon. (1926), Barrett *et al.* (2003), Beruldsen (2004), Blakers *et al.* (1984), Christidis & Boles (2008), Condon (1951), Fletcher (1926), Ford (1971), Frith (1969), Garnett & Crowley (2000), Green (1989, 1995), Griffioen & Clarke (2002), Higgins *et al.* (2006a), Kinghorn (1928), Pizzey *et al.* (2007), Plowright (2006), Recher & Davis (1998), Schodde & Mason (1999), Serventy & Whittell (1967), Sharpe (1877), Sibley & Ahlquist (1985a), Sibley & Monroe (1990), Simpson & Day (2004), Slater *et al.* (2003), Storr (1991), Van Bael & Pruett-Jones (2000), Watts (2002).

Genus *PELTOPS* Wagler, 1829

11. Lowland Peltops

Peltops blainvillii

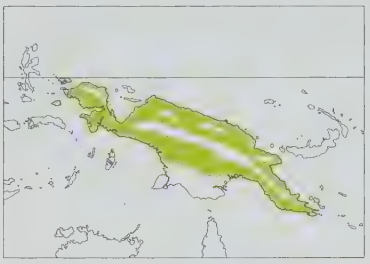
French: Peltopse des plaines **German**: Waldpeltops **Spanish**: Peltopo Llanero
Other common names: Clicking Peltops, Lowland Peltops-flycatcher/Shieldbill

Taxonomy. *Eurylaimus Blainvillii* Lesson and Garnot, 1827, Dorey (= Manokwari), north-west New Guinea.

Forms a superspecies with *P. montanus*. Monotypic.

Distribution. West Papuan Is (Waigeo, Salawati and Misool) and most of lowland New Guinea (apparently largely absent from Trans-Fly region).

Descriptive notes. 18–19 cm; c. 30 g. Smaller than butcherbirds, large-headed and stout, with large hook-tipped bill, shallowly forked tail and striking red, white and black plumage. Plumage is mostly glossy bluish-black, flight-feathers and tail with brown tinge; conspicuous white patch on side of head from behind eye to side of neck, few white feathers in mantle forming smudgy white patch; rump and uppertail-coverts red, and thighs, lower abdomen and undertail-coverts red; underwing white; iris red to dark red-brown; bill and legs black. Distinguished from very similar *P. montanus* by usually less extensive white on side of head, not reaching above eye level, and less white on back (also differs in some vocalizations). Sexes similar in plumage, male slightly larger than female. Juvenile is similar to adult but duller, with greyish-black plumage, and some white on throat and white tips of upperwing-coverts. VOICE. Song an unmusical series of clicks, described as similar to sound made by winding up a clock with a key; also described as three rapid pairs of notes all on one pitch, first note of each pair short and unstressed; may be repeated many times, singer throwing head down and forwards as each burst of notes uttered. Single loud, hoarse, upslurred "wheep" occasionally given; rarely, a high-pitched twittering call similar to common call of *P. montanus*.



Habitat. Canopy of lowland rainforest, especially at openings and edges; treefalls, road verges and river edges, and other disturbed areas, such as gardens. To c. 600 m. Replaced at higher elevations by *P. montanus*.

Food and Feeding. Mainly flying insects, including dragonflies (Odonata). Groups of three or four individuals spend long periods on high open perches, calling, and sallying after flying insects, sometimes almost down to ground level. Some insects snatched from foliage, especially in regrowth habitats. Prey taken to perch and consumed after little preparation.

Breeding. Little known. Breeds probably in middle to late dry season. Territorial, present in territory all year. Nest reported as a small cup of twigs and rootlets, more than 6 m above ground in outer branches of tree at edge of clearing. Clutch size not known, but single nestlings and single fledglings reported; egg said to be yellowish-white with slight reddish sheen, and ring of dark brown spots at broader end. No other information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Widely distributed. Survey near Port Moresby found density of 2 birds/10 ha. Extensive logging of lowland rainforest likely to lead to decreases in size and extent of populations; nevertheless, able to live in ecologically disturbed areas and regrowth so long as high perches from which to forage are still present.

Bibliography. Beehler *et al.* (1986), Bell (1982a, 1982e), Coates (1990), Gilliard & LeCroy (1961, 1966, 1967a, 1967b), Junge (1953), Leach (1914), Mayr & Rand (1937), Rand (1942a, 1942b), Ripley (1964), Schodde & Hitchcock (1968), Sibley & Ahlquist (1984a), Stresemann (1923), Watson *et al.* (1982).

12. Highland Peltops

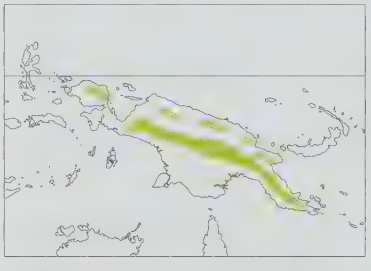
Peltops montanus

French: Peltopse des montagnes **German**: Bergpeltops **Spanish**: Peltopo Montano
Other common names: Mountain Peltops/Peltops-flycatcher, Singing Peltops/Peltops-flycatcher/Shieldbill

Taxonomy. *Peltops blainvillii montanus* Stresemann, 1921, Hunsteinspitze, Sepik Mountains, New Guinea.

Forms a superspecies with *P. blainvillii*. Monotypic.

Distribution. Highland New Guinea in Vogelkop (Tamrau Mts and Arfak Mts) and C cordillera from Weyland Mts E to Huon Peninsula and SE peninsula.



Descriptive notes. 20 cm; 27–36 g. Smaller than butcherbirds, large-headed and stout, with large hook-tipped bill, shallowly forked tail and striking red, white and black plumage. Plumage is mostly glossy bluish-black, flight-feathers and tail with brown tinge; conspicuous white fan-shaped patch on side of head from behind eye to side of neck, large white patch on back; rump and uppertail-coverts red, thighs, lower abdomen and undertail-coverts red; underwing white; iris orange-red to dark red-brown; bill and legs black. Differs from very similar *P. blainvillii* in slightly larger size, although bill same size (thus looks relatively smaller), white patch on side of head typically larger and reaches above eye level, larger and more conspicuous white patch on back (also differs in some vocalizations). Sexes similar, male slightly larger than female. Immature is similar to adult but duller, with white tips on some wing feathers and some white on chin and throat. VOICE. Most frequent call a very rapid series of 6–12 soft notes given in less than 1 second, descending slightly in pitch, likened to sound made by running a finger along teeth of a comb. Occasionally a hoarse upslurred "wheep", similar to that of *P. blainvillii*; also high-pitched repeated whistled "ti-chew".

Habitat. Montane rainforest; tall forest trees at edges of open spaces, in similar habitat to that of *P. blainvillii*. Seen near landslips, treefalls, along rivers or roads, in gardens; in virgin forest, observed in emergent trees or along ridges. Generally above 600 m, and to 3000 m; occasionally slightly lower, down to 550 m.

Food and Feeding. Food mainly insects, including beetles (Coleoptera) and adult bugs (Hemiptera), also large moths (Lepidoptera). Sallies out from conspicuous perch at 15 m or more above ground, returning to same perch or one nearby.

Breeding. Little known. Nest records indicate breeding during late dry season to early wet season, at least. Nest reported as a small cup of twigs and rootlets, placed 7–35 m above ground in horizontal fork at end of outer branch; two nests each held a single nestling. No other information.

Movements. Resident.

Status and Conservation. Not globally threatened. Widely distributed. Poorly known, but probably not uncommon.

Bibliography. Beehler *et al.* (1986), Coates (1990), Diamond (1972), Gilliard & LeCroy (1967), Lamothe (1979), Mayr & Rand (1937), Rand (1942b), Rand & Gilliard (1967), Ripley (1964), Sibley & Ahlquist (1984a), Stresemann (1923).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family PITYRIASEIDAE (BRISTLEHEAD)



- Large passerine with short tail and very large hooked bill; plumage black and red, with orange "bald" crown.
- 22–26 cm.



- Borneo.
- Tropical rainforest.
- 1 genus, 1 species, 1 taxon.
- No species threatened; none extinct since 1600.

Systematics

Of the myriad birds with uncertain phylogenetic affinities and convoluted taxonomic histories, few can rival the Bristlehead (*Pityriasis gymnocephala*) of Borneo for the sheer number of taxonomic assignments and confusion with regard to its evolutionary history. Because of its unique appearance, the Bristlehead has been called "one of the strangest members of all the Oscines" by E. Mayr and D. Amadon. Described in 1836, this species was viewed by early taxonomists as a shrike (Laniidae) and, because of its large size and heavy hooked bill, it was placed next to the Australian genera *Cracticus* and *Gymnorhina* (subsumed into *Cracticus* in the present work), which were at that time also considered to be shrikes but are nowadays placed in the butcherbird family, Cracticidae. Towards the end of the nineteenth century, taxonomists suggested other possible relationships for the Bristlehead, most notably with the starlings (Sturnidae), particularly the large mynas (*Gracula*). R. B. Sharpe retained *Pityriasis*, along with *Cracticus* and *Gymnorhina*, in Laniidae, but he placed that family next to the helmet-shrikes (Prionopidae) and the vangas (Vangidae). In the mid-twentieth century, the Bristlehead was moved among several groups, including the starlings, the babblers (Timaliidae), the helmet-shrikes, the laniid shrikes (without the cracticids) and the wood-shrikes (*Tephrodornis*). Indeed, for much of the twentieth century, the common name of the Bristlehead was "Bald-headed Wood-shrike", suggesting a relationship with the true wood-shrikes. By 1980, the Bristlehead had been allied with no fewer than seven families, spanning much of the oscine radiation.

The uncertainty over this species' relationships appeared to be resolved in 1984, with the technique of DNA–DNA hybridization. Analyses by J. E. Ahlquist and colleagues indicated that the Bristlehead was closest to the cracticid genera *Cracticus*, *Gymnorhina* and *Strepera*, thereby supporting the earliest taxonomic treatments. The results of recent DNA-sequencing studies, however, appear to dispute this finding, and suggest that the Bristlehead is, instead, a member of a diverse group of shrike-like birds that are distributed across the Old World tropics. This group, which includes vangas, bush-shrikes (Malaconotidae), helmet-shrikes, wood-shrikes, philentomas (*Philentoma*), wattle-eyes (*Platysteira*), ioras (*Aegithina*) and assorted other genera, is evidently sister to the cracticids and the woodswallows (Artamidae). Within this purported group, the Bristlehead is not particularly close to any species, and it may have diverged from its nearest living relatives as long as 20 million years ago. The Bristlehead lineage has either diversified little over the past several millennia, or the species is the sole survivor of a more speciose radiation. Given the complexity of relationships and geographical dispersion of its supposed relatives, together with the unique characters of the bird itself, it is perhaps not surprising that efforts to classify the Bristlehead have led to such disparate conclusions.

The biogeographical history of the Bristlehead and, indeed, of the entire group of shrike-like birds to which it seems to be related is not at all clear. One of the main problems is that the group contains genera from several different tropical regions. For example, the helmet-shrikes, the wattle-eyes and the bush-shrikes are all restricted to Africa, the vangas to Madagascar, the philentomas, ioras and wood-shrikes to South-east Asia, and the cracticids to Australasia. The species within each of these tropical regions, however, are not necessarily closely related to one another. Bush-shrikes, for example, are more closely related to the Asian Bristlehead and ioras than they are to other African taxa. These convoluted geographical and phylogenetic relationships would seem to indicate that dispersal, extinction and other vagaries of evolution have played an important role in shaping the history of the shrike-like group. On a more local scale, in the Sundan archipelago, the Bristlehead appears to fill the "large-shrike niche", but it is unclear why it is restricted to Borneo, rather than being present also in Sumatra, Java and Peninsular Malaysia.

Morphological Aspects

One of Borneo's oddest bird species, the Bristlehead is a fairly large passerine, weighing 115–150 g and measuring about 25 cm in length. Its bulky yet compact appearance is due in part to its extremely short tail. The wings, on the other hand, are long and powerful. A particularly striking feature is the massive bill, the upper mandible of which has a rather prominent hooked tip.

The name *Pityriasis* is derived from the Greek and can be loosely translated as "suffering from dandruff". The specific name, *gymnocephala*, means "bald-headed" and refers to the most distinctive characteristic of the Bristlehead, the featherless patch on top of its head, which is covered with bright yellow to orange bristle-like protrusions. There are, in fact, no true bristles anywhere on the crown, which is, instead, covered with a dense

carpet of finger-like outgrowths of skin. Although these may resemble bristles in dry study skins, they are in reality specialized tubes or filaments 3–4 mm long, indicative of the most basic developmental level of feather growth. The Bristlehead also has distinctive dark grey, bristle-like modified contour feathers on its ear-coverts and upper breast. The remainder of the face, the neck and the thighs are bright red. Most of the rest of the body is black, the exceptions being the breast feathers and scapulars, which are charcoal-grey with black edges, giving the bird a scaled appearance. The wings are blackish, but have a white patch near the bases of the primaries, which is normally visible only when the bird is in flight.

Female Bristleheads are generally thought to differ from males in having red edges on some of the flank feathers, but although females always have some red on their flanks, some males also exhibit this characteristic.

Juveniles, at least in the early stages after fledging, show several features that permit them to be separated from adults. They have the head and neck more orange-red than in adults; the ear-coverts are red, rather than grey; the ear and breast contour feathers are not modified into bristles; the breast and flanks are mottled red and black; and the amount of red on the thighs is reduced.

Habitat

The Bristlehead occurs in a wide variety of habitats, and it is difficult to pinpoint one preferred type. It is found in undisturbed and disturbed dipterocarp forest, in upland heath forest (known also as *kerangas* forest), in coniferous lower-montane forest, in coastal swamp-forest, and in mangroves. It has also been observed in *Acacia mangium* plantations, both adjacent to and distant from primary forest. For many years it was thought to be strongly associated with peatswamp-forest, but in more recent times it has become clear that this was a misconception, as this particular habitat type appears to be relatively unimportant for the species. The Bristlehead is most commonly recorded in lowland and upland areas from sea-level to 600 m, but it has also been reported at about 1000–1200 m in the Maliau Basin, in Sabah, and at Mount Palung, in western Kalimantan.

The Bristlehead appears to be mainly a canopy species, sometimes feeding in emergent trees and rather less commonly descending to the middle storey. This would explain why it is rarely, if ever, mist-netted by ornithologists undertaking research within its range.

General Habits

Much of the life history of the Bristlehead is a mystery. The little that is known about this species has been pieced together from old specimen records and from a number of casual recent field observations. There have been no ecological studies of the species.

The Bristlehead appears to be a social species, virtually always occurring in flocks. Generally, groups consist of about six to ten individuals, although some coastal parties can be smaller, containing four or five individuals. These flocks are cohesive, their members staying normally within 20 m of one another. When a Bristlehead is injured or captured, other members of its flock congregate around the victim, while making a tremendous racket and approaching close to humans.

The movements of the Bristlehead are largely unpredictable. The literature is rife with anecdotes related by frustrated birdwatchers and ornithologists who, despite intense efforts, have failed to see the bird in the field. B. E. Smythies, author of *The Birds of Borneo*, managed to observe it on only five occasions between 1949 and 1956, and E. Banks, the former curator of the Sarawak Museum, saw it only once in a period of 20 years. Although the Bristlehead has been recorded many times in the Kabili-Sepilok Forest Reserve and in Danum Valley, both in Sabah, the chances of finding it on any given day are not good. The remarkable unpredictability of this species suggests that it probably forages over large areas. Observations from high-elevation lookouts confirm that flocks of the species move widely on a daily basis. There is a possibility also that it may undertake seasonal movements to some extent, as indicated by birdwatching records in Danum Valley (see Movements). When breeding, however, Bristleheads appear to remain in a single location, as would be expected. Those at the Brumas timber camp, in Sabah, which were carrying nesting material, were observed daily for a period of two to three weeks.



*Few birds rival the **Bristlehead** in the sheer diversity of its taxonomic assignments: no less than seven different families by 1980. DNA sequencing now suggests the Bristlehead is a member of a diverse group of shrike-like birds distributed across the Old World tropics. The biogeographical history of this group is unclear. The bush-shrikes (Malaconotidae) of Africa, for example, are probably more closely related to the Asian Bristlehead than to any other African taxa. The Bristlehead may have diverged from its nearest living relatives some 20 million years ago. In the Greater Sundas, the Bristlehead fills the "large-shrike niche", but nobody knows why it is restricted to Borneo and absent from Sumatra, Java and Peninsular Malaysia.*

[*Pityriasis gymnocephala*, Borneo. Photo: Severino Paulin, Jr]

Bristleheads often join with other forest species in mixed flocks. Species with which they associate include malkohas (*Phaenicophaeus*), trogons (of genus *Harpactes*), hornbills (Bucerotidae), woodpeckers (Picidae), babblers, Black Magpies (*Platysmurus leucopterus*), and drongos (*Dicrurus*).

Not surprisingly, nothing is known of the comfort behaviour and maintenance activities of the Bristlehead.

Voice

The vocalizations of the Bristlehead are distinctive, and are often the single thing that reveals the presence of these birds in an area. Flocks of Bristleheads constantly call with a variety of snorts and whistles. An unobtrusive nasal, whining contact call is regularly given by individuals in a flock that may otherwise be silent. Another contact call is a single loud whistle, repeated by each flock-member within the space of 2–3 seconds. In addition, a "pit-pit-peeoo", interspersed with a corvid-like chatter, is commonly uttered.

A particularly distinctive vocalization made by this species consists of a long high-pitched tone followed by a low even note of similar length, with a quick five-note staccato, and then a short trailing note.

Food and Feeding

The diet of this species consists largely of invertebrates. Recorded foods are katydids (Tettigoniidae), cicadas (Cicadoidea), stick-insects (Phasmida), beetles (Coleoptera), caterpillars (Lepidoptera), cockroaches (Blattodea), spiders (Araneae) and termites (Isoptera). The Bristlehead dismantles large insects, for which purpose it uses a branch as a brace against which to hold the prey; it then removes and discards the insect's wings and legs, before consuming the rest. Bristleheads will also seize small reptiles and amphibians when these are available, and they will occasionally take small to medium-sized fruits. They have been observed to feed on fruits the size of an olive (*Olea*) or a plum (*Prunus*), but these seem not to be a major part of the diet.



*The rather chubby appearance of the **Bristlehead** is partly due to its extremely short tail. Its wings, however, are long and powerful. The yellow or orange bristle-like features covering the featherless patch on its head are, in fact, finger-like protrusions of skin. The species also has distinctive dark grey, bristle-like modified contour feathers on its ear-coverts and upper breast. The face, neck and thighs are bright red, and the rest of the bird black and charcoal-grey; the grey edges of the scapulars giving the bird a scaly look. The massive bill has a prominent hook on the upper mandible. The Bristlehead appears to be mainly a canopy species, sometimes feeding in emergent trees, and less commonly descending to the middle storey. It is found in a wide variety of disturbed and undisturbed forest habitats.*

[*Pityriasis gymnocephala*, Sepilok Reserve, Sabah, Borneo. Photo: Sookiong Vun]

Bristleheads most often forage in flocks for insects, and they employ a variety of methods. They glean prey items from the foliage and twigs in the upper part of the forest canopy and, at times, in emergent trees. They may fly short distances in order to pounce on prey, and they occasionally take prey by sally-gleaning. Only rarely do individuals or groups remain in one feeding spot for more than a few moments.

When foraging, Bristleheads often move along large horizontal branches in an ungainly manner, making sideways hops, and their mode of advancing has been likened to that of a woodpecker. They also hop up lianas, turning 180° on each hop. Their movements are relatively acrobatic, although slow and heavy, making them look rather like giant tits (Paridae).

*The calls of the **Bristlehead** are distinctive, including a variety of snorts and whistles, and a long high-pitched tone followed by a low even note of similar length, with a quick five-note staccato, and then a short trailing note. The Bristlehead appears to be a social species, usually seen in flocks of six to ten birds, which keep together with a variety of contact calls.*

[*Pityriasis gymnocephala*, Sepilok Reserve, Sabah, Borneo. Photo: Juan Mazar Barnett]

Breeding

Barely anything is known about the breeding behaviour and biology of the Bristlehead, and its nest remains undescribed. An oviduct egg of this species collected on 8th October, presumably in Sarawak, was described by E. Bartlett in 1896. It measured approximately 31 × 25 mm and was pure white, sparingly marked all over with circular and oval bright brown and slaty-grey spots of various sizes, the majority forming an irregular ring at the larger end. On the basis of data on specimen labels, Bristleheads appear to breed over a period of several months in eastern Sabah. This is revealed by the fact that a female from Brumas, in south-eastern Sabah, had enlarged ova and ruptured ovarian follicles, indicating recent egg-laying, on 18th May 1982; a specimen from Sapagaya Forest Reserve, near Gomantong, had an oviduct egg measuring 14 × 14 mm on 5th August 1983; and another, from Quoin Hill, had a 15-mm ovum, an enlarged oviduct and a well-developed brood patch on 4th October 1962.

Several lines of evidence suggest that Bristleheads are communal breeders, whereby groups of adults attend to the tasks of nest-building and caring for the young. Since the nineteenth century, ornithologists have noticed a high ratio of adults to juveniles in flocks of this species. Several members of a flock observed at Brumas in May 1982 were carrying nesting material, and two different individuals, both apparently female, were seen to feed a single fledgling at Mount Palung, in western Kalimantan. Some, but not all, of what appear to be the Bristlehead's closest relatives are also communal breeders, examples being the helmet-shrikes and the cracticids.

Movements

Insufficient information is available on this species to determine the extent of its movements. It certainly ranges widely while foraging (see General Habits), and its movements would appear to be governed by the availability of food.

Interestingly, records of Bristleheads in Danum Valley appear to be seasonal, at least to some degree, and this suggests that the species may perhaps make some seasonal movement in this region. The possibility of some altitudinal movement has been proposed.

Relationship with Man

No particular relationship is known to exist between the Bristlehead and the native peoples of Borneo. Indeed, prior to the growth in ecotourism, it was little known among native Borneans, perhaps because it was rarely encountered. As far as visiting ornithologists are concerned, however, the Bristlehead has a special significance, for it is generally the species most prized by birdwatchers in Borneo. As a result, its significance is now recognized, and the species is commonly "staked out" by local tour-leaders.

The Malay term for the Bristlehead is *Tiong Batu*, meaning "stone myna". It refers to the onomatopoeic name and sound, a loud "tiong", of the Common Hill Myna (*Gracula religiosa*), which resembles the Bristlehead both in size and in its possession of a white wing flash.



Status and Conservation

The Bristlehead is placed by BirdLife International in the category of Near-threatened. It is a forest-dwelling species restricted to Borneo, where its numbers are thought likely to be declining as a direct consequence of the increasingly widespread loss and degradation of forest throughout much of the island. Nevertheless, although virtually all lowland and upland forest in Borneo is disturbed, and large portions of forest have been destroyed, the effects of these habitat modifications on the Bristlehead are not fully understood.

As already noted (see Habitat), this species can be found in a remarkable array of habitats, from mangroves on the coast in Sarawak to coniferous forest in interior highlands of Sabah. It has even been observed recently in *Acacia mangium* plantations, including plantations that are far removed from primary forest. In none of these habitats, however, could it be considered a common species.

The main threat to the Bristlehead's survival is the continuing loss of its habitat. Rates of forest destruction in the lowlands have increased, especially in Kalimantan, where illegal logging and land conversion have become major threats, and all remaining stands of valuable timber are deliberately targeted. Although the magnitude of these threats may perhaps be lessened by this species' tolerance of logged forest, secondary forest and hill forest, detailed research is needed in order to determine its full habitat requirements.

The Bristlehead is known to occur in several protected areas. Examples are Tawau Hills National Park, Danum Valley Conservation Area, Kabili-Sepilok Forest Reserve and Sapagaya Forest Reserve, all in Sabah; Sepipong Reserve and Anduki Forest Reserve, in Brunei; Lambir Hills National Park and Samunsam Wildlife Sanctuary, in Sarawak; and Gunung Palung National Park, in Kalimantan. Even forest lying within the bounds of protected areas is not secure, however, as illegal logging takes place in these areas too.

Without greater knowledge of the foraging and breeding requirements of the Bristlehead, and in the absence of reliable estimates of its population size, no accurate statement on its conservation status can be made. Despite this, and in view of the marked lack of data on the species, it is advisable that repeat surveys be conducted in areas within and around those where it is known to occur in an attempt to ascertain rates of population decline or range contraction. Furthermore, there is a need for ecological studies aimed at improving our understanding of the Bristlehead's precise habitat requirements, its tolerance of secondary habitats and its response to habitat fragmentation.



PLATE 18

inches 3
cm 8

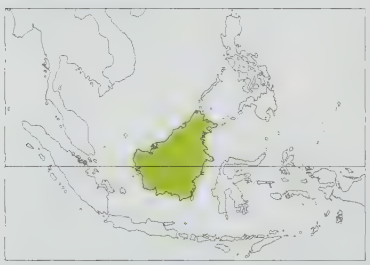
Genus *PITYRIASIS* Lesson, 1839

Bristlehead

Pityriasis gymnocephala

French: Barite chauve **German**: Warzenkopf **Spanish**: Gimnocéfalo
Other common names: Bornean Bristlehead, Bald-headed Wood-shrike/Crow, Bristled Shrike/Starling

Taxonomy. *Barita gymnocephala* Temminck, 1836, Borneo.
Relationships uncertain. Has in the past been considered closely related variously to shrikes (Laniidae), starlings (Sturnidae), helmet-shrikes (Prionopidae), vangas (Vangidae), butcherbirds (Cracticidae), babblers (Timaliidae) and wood-shrikes (*Tephrodornis*). DNA analysis indicated close affiliation with cracticid genera *Cracticus*, *Gymnorhina* and *Strepera*; more recent DNA-sequencing studies, however, suggest that present species belongs to a diverse group of shrike-like birds which includes vangas, bush-shrikes (Malaconotidae), helmet-shrikes, wood-shrikes, philentomas (*Philentoma*), wattle-eyes (*Platysteira*), ioras (*Aegithina*) and assorted other genera, this group being sister to the cracticids and the woodswallows (Artamidae). Monotypic.
Distribution. Borneo.



Descriptive notes. 22–26 cm; 115–150 g. Heavy-bodied passerine with massive hooked bill and short tail, giving top-heavy appearance, and long powerful wings. Male has unfeathered top of head bright yellow to orange with short outgrowths of skin, broad area of bare skin around eye pink-red, ear-coverts bristle-like and charcoal-grey, with remainder of face, neck and thighs bright red; most of body black, breast feathers and scapulars charcoal-grey with black edges (giving scaled appearance), sometimes some red in flank feathers; white wing patch resembling that of Common Hill Myna (*Gracula religiosa*), visible in flight; iris dark reddish-brown; bill black; legs pink to yellowish-pink. Female is like male, except that flank feathers always red (male variable in this characteristic). Juvenile, on fledging, is distinguished from adult by having head and neck more orange-red, ear-coverts red, rather than grey, ear and breast contour feathers not modified into bristles, breast and flanks mottled red and black, reduced amount of red on thighs, red eyering and greyish legs; subsequently, has black thighs, red ear-coverts, hindneck spotted with black, a few red feathers on bald head. Voice. Calls frequently, with variety of snorts and whistles. Unobtrusive nasal, whining contact call given regularly by flock-members; single loud whistle, repeated by each flock-member, also for contact; "pit-pit-peeoo", interspersed with corvid-like chatter, commonly uttered. Also, a distinctive vocalization consisting of a long high-pitched note followed by a low even note of similar length, then rapid 5-note staccato, and short trailing note.
Habitat. Forest. Often said to favour peatswamp-forest, but is probably most commonly associated with primary dipterocarp forest, and found also in various other forest types, including disturbed dipterocarp forest, upland heath forest (*kerangas* forest), montane coniferous forest, coastal swamp-forest, and mangrove; also *Acacia mangium* plantations (both adjacent to and far from primary forest). Lowlands to 600 m, locally to 1000 m.
Food and Feeding. Major food items include katydids (Tettigoniidae), cicadas (Cicadoidea), stick-insects (Phasmida), beetles (Coleoptera), caterpillars (Lepidoptera), cockroaches (Blattodea), termites (Isoptera) and spiders (Araneae); small reptiles and amphibians sometimes taken; small fruits occasionally consumed. Forages in canopy and subcanopy, sometimes also in emergent trees. Most food taken by gleaning, sometimes by sally-gleaning; will also pounce on prey at short distance. Forages in flocks of up to ten or so individuals; often with mixed-species flocks.
Breeding. Few data. Season apparently May–Oct, perhaps depending on rainfall and food availability. Possibly a co-operative breeder, several adults helping with nest-building and offspring care. Nest not described. No information on clutch size; one egg described as white, sparingly marked all over with bright brown and slaty-grey spots of various sizes, majority forming irregular ring at larger end, dimensions 31 mm × 25 mm. No other information.
Movements. No hard information. Foraging flocks wide-ranging, perhaps seasonally influenced.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Uncommon, and not often observed; population size and precise habitat requirements not known. Thought likely to be declining as a result of loss and degradation of forest throughout much of Borneo; habitat loss continuing, and fires also cause serious damage to habitat. Rates of forest loss in lowlands have increased, especially in Kalimantan, where illegal logging and land conversion now major threats, even in protected areas. This species is tolerant of logged forest, secondary forest and hill forest, but research required to determine its full habitat requirements; although extensive forest disturbance in Borneo likely to prove detrimental, its occurrence in a wide variety of habitats suggests some resilience. Occurs in several protected areas.
Bibliography. Ahlquist *et al.* (1984), Anon. (2008f), Barker *et al.* (2004), Bartlett (1896), Bock (1994), Butchart & Stattersfield (2004), Colenutt (2002), Collar *et al.* (2001), Dickinson (2003), Duckworth *et al.* (1996), Goenner (2000), Gove (1986), Hachisuka (1953), Hose (1893), MacKinnon & Phillipps (1993), Mayr (1938), Mayr & Amadon (1951), Mitsch (1977), Moyle *et al.* (2006), Prum & Brush (2002), Raikow *et al.* (1980), Rand (1960a), Sharpe (1877), Sheldon *et al.* (2001), Shelford (1899), Sibley (1996), Sibley & Ahlquist (1985a, 1990), Sibley & Monroe (1990, 1993), Smythies (1957, 1984a), Smythies & Davison (1999), Snow (1985), Stattersfield & Capper (2000), Stettenheim (1973), Thompson (1966), Witt & Sheldon (1994).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family PTILONORHYNCHIDAE (BOWERBIRDS)



- Medium-sized, compact, robust passerines, most with stout and powerful bill; adult males with strikingly diverse and often colourful plumage, females generally duller.
- 22–37 cm.



- New Guinea and Australia.
- Rainforest, also drier sclerophyll habitats.
- 8 genera, 20 species, 43 taxa.
- No species threatened; none extinct since 1600.

Systematics

The position of the bowerbirds (Ptilonorhynchidae) within the oscine passerines was unsettled through history until recent decades, reflecting uncertainty about bowerbird origins and their immediate relationship to other bird groups. As a result of several striking similarities in zoogeography, morphology, ecology, mating systems and the behavioural consequences of them, they were for a long time believed to be most closely associated with the birds-of-paradise (Paradisaeidae), and were often combined within the latter family. More recently, the results of several biomolecular studies have provided clear evidence of the discrete status of the Ptilonorhynchidae not only as a valid family, but also as a highly distinctive one relatively distant from, and basal to, the Paradisaeidae within the oscines.

Nowadays, it is widely acknowledged that the majority of Australasian passerines, about 85% of the total, are derived from a southern, or Gondwanan, origin. This major group, referred to as the "Corvida", radiated in Australia and New Guinea, and today it comprises three major lineages. These are the Menuroidea, which includes the bowerbirds, the Meliphagoidea, and the Corvoidea, which includes the birds-of-paradise. Extant bird groups considered closest to the bowerbirds are the Australasian treecreepers (Climacteridae) and the lyrebirds (Menuridae), the latter being considered the most primitive of the oscines. The recently mooted opinion that the Piopio (*Turnagra capensis*), a New Zealand endemic and sole member of the family Turnagridae, was in fact a bowerbird appears, from several lines of evidence, most unlikely to prove valid. Some taxonomists consider the North Island and South Island populations of the Piopio to represent two distinct species, both now, unfortunately, extinct (see HBW7, pages 52–53).

It is believed that the bowerbirds belong to a broad radiation of birds that occurred in Australasia during the past 60 million years, and it has been proposed that they diverged from the lyrebirds and the scrub-birds (Atrichornithidae) of Australia some 45 million years ago. Recent biomolecular researches, involving the application of hypothetical "molecular-clock" calibrations, suggest that their separation from broadly corvid-like relatives, including the birds-of-paradise, occurred about 28 million years ago and that the major lineages within the Ptilonorhynchidae arose approximately 24 million years ago. Such calculations, however, remain far from definitive, and the notion of a molecular clock is considered questionable by a number of scientists.

Contemporary consensus is that bowerbirds represent a basal, or primitive, group of Australasian oscine passerines. Supporting this view is the presence of a single corvoid pneumatic fossa (a depression or hollow) in the humerus bones of bowerbirds. Bowerbirds have characters of the legs, feet, palate, syrinx and sperm which, together, define them as a distinct family, but none of which is unique to them. While bowerbird anatomy is broadly typical of that of higher passerines, there are a couple of notable exceptions. The first of these is an enlarged lachrymal, which is part of the cranium bone structure, near the eye socket, and which represents a character unique to the Ptilonorhynchidae within the perching birds, and otherwise paralleled only by the lyrebirds. The second conspicuous difference is that the bowerbirds possess a greater number of secondaries,



Bowerbirds form a monophyletic family comprising 20 closely related species. Ten are restricted to mainland New Guinea, eight confined to Australia, and two found in both New Guinea and Australia. Ten races of ***Black-eared Catbird*** *are recognized, in New Guinea, Australia and offshore islands. The three species of catbird form a distinct subgroup, the genus* Ailuroedus. *Named after their cat-like calls, catbirds are monogamous, and neither clear courts nor build bowers. Recent biomolecular research suggests that catbirds diverged from other bowerbird genera about 24 million years ago.*

[*Ailuroedus melanotis maculosus*, Atherton Tableland, Queensland, Australia. Photo: Clifford & Dawn Frith]



The four silky bowerbirds forming the genus Sericulus *are among the ten bowerbird species that build avenue bowers out of parallel walls of sticks or grass stems. Bowerbirds measure 22–37 cm in body length, and weigh 80–200 g. In most of the polygynous species, females are slightly smaller than males, but females of the* ***Flame Bowerbird*** *and two other* Sericulus *species are the same size or slightly larger than their respective males. Size increases with altitude in New Guinea. The upland-dwelling Adelbert* (S. bakeri) *and Masked Bowerbirds* (S. aureus) *are larger than the lowland Flame Bowerbird.*

[*Sericulus ardens*. Photo: Clifford & Dawn Frith]

11–14 in total, including tertials, than most other passerines, which have only nine or ten. Bowerbirds typically lay small clutches (see Breeding), the 1–3 eggs being laid at two-day intervals. They have relatively long incubation and nestling periods for songbirds of their body weight, and the period over which the adults accompany the young after they have left the nest is extended, thus improving juvenile survival. These are features typical of some, but not all, Australian perching birds of Gondwanan origin, namely the Corvida.

Extant bowerbirds form a monophyletic family comprising 20 closely related species. Ten of them are restricted to mainland New Guinea, eight are confined to Australia, and two species are found in both New Guinea and Australia. Only the White-eared Catbird (*Ailuroedus buccoides*), the Black-eared Catbird (*Ailuroedus melanotis*) and the Great Bowerbird (*Chlamydera nuchalis*) occupy offshore islands, each of them being present also on the nearby continental mainland. Bowerbirds occur predominantly within the tropics and subtropics, only the Satin Bowerbird (*Ptilonorhynchus violaceus*) ranging significantly southwards into temperate Australia.

The eight genera currently acknowledged have largely been conservatively maintained throughout the history of the group. The three species of catbird form a distinct subgroup, the genus *Ailuroedus*; these monogamous members of the family neither clear a court nor build a bower as part of their reproductive behaviour. The catbirds were once grouped together with the Tooth-billed Bowerbird (*Scenopoeetes dentirostris*), which was at the time thought, erroneously, to be similarly monogamous. Recent studies have shown, however, that the Tooth-billed Bowerbird is a court-clearing polygynous species that constitutes a valid monotypic genus. Males of the remaining 16 bowerbird species, all of them also polygynous, build bower structures of two major types, the maypole type and the avenue type (see Breeding). Of the six maypole-builders, four are gardener bowerbirds, forming the genus *Amblyornis*, and the other two, each in a monotypic genus, are Archbold's Bowerbird (*Archboldia papuensis*) and the Golden Bowerbird (*Prionodura newtoniana*). The ten avenue-builders consist of the four silky bowerbirds, forming the genus *Sericulus*, the Satin Bowerbird, in its own genus, and the five grey bowerbirds, forming *Chlamydera*.

In 2008, a review and revision of the systematics and taxonomy of Australian birds was published. The authors, L. Christidis and W. E. Boles, applied all available evidence, including the results of recent molecular-genetic studies, and subsumed *Prionodura* into *Amblyornis* and *Chlamydera* into *Ptilonorhynchus*. Apparently inconsistent with this reduction to five bowerbird genera, however, is that the revision did not place *Sericulus*, too, into the newly enlarged *Ptilonorhynchus*, despite the fact that one *Chlamydera* species, Lauterbach's Bowerbird (*Chlamydera lauterbachi*), exhibits plumage characters clearly intermediate beween those of *Sericulus* and those of *Chlamydera*.

Recent studies have resolved most of the limited historical controversies regarding relationships among the various bowerbird taxa. The three catbird species are most obviously more closely related to one another than they are to any other bowerbirds; recent biomolecular research indicates that they diverged from other bowerbird genera about 24 million years ago, and that they are quite distinct from builders of avenue bowers. The Tooth-billed Bowerbird is as distinct from the catbirds as are other bowerbird subgroups and is, in fact, genetically closer to New Guinea gardener bowerbirds than it is to catbirds.

The status of the four gardener bowerbirds as species has been constant, each being associated with a distinctive maypole bower form. This situation has recently been complicated, however, by the discovery that both the Yellow-fronted Bowerbird (*Amblyornis flavifrons*) of the Foja Mountains, a very poorly known species, and populations of the Vogelkop Bowerbird (*Amblyornis inornata*) on the Fakfak and Kumawa Mountains, in the Bomberai Peninsula, build simplistic bowers, more like those of MacGregor's Bowerbird (*Amblyornis macgregoriae*). While Bomberai Peninsula bowers are quite unlike those of the Vogelkop Bowerbird in the Vogelkop Peninsula of north-west New Guinea, the birds concerned are thought to represent an isolated conspecific population, but this is not conclusively established. In the light of the otherwise highly species-specific form of bower shape within the family, it is not impossible that the taxonomic status of the bowerbirds in the Bomberai Peninsula may change.

Within the polygynous bowerbirds, two broadly distinctive clades are discernible. The species in the maypole-building genera *Amblyornis*, *Archboldia* and *Prionodura*, with the possible inclusion also of *Scenopoeetes*, constitute one clade and the avenue-building *Sericulus*, *Ptilonorhynchus* and *Chlamydera* the other. The close relationship among the genera of each of these clades is clearly emphasized by a review of numerous and obvious similarities in traits of their morphology, bower structures and decorations, courtship, nidification, and nesting biology. Recent biomolecular research indicates that the grey bowerbirds forming the genus *Chlamydera* split off from the Satin Bowerbird about 12 million years ago.



The five "grey" bowerbirds of the genus Chlamydera *include the largest member of the family, the* ***Great Bowerbird****. Both sexes of the Australian Great Bowerbird are brownish-grey; the male has an erectile, pinkish-mauve crest on the nape, which is much smaller or absent in the female.* Chlamydera *bowerbirds are avenue-builders. While most bowerbird species are confined to wet forests, the five grey bowerbirds have adapted to the drier, more open environments of riverine forests, open woodland, savanna, forest–grassland communities and, in Australia, to near-desert conditions.*

[*Chlamydera nuchalis nuchalis*, Kakadu National Park, Northern Territory, Australia. Photo: Hanne & Jens Eriksen]

Four intrageneric wild hybrid crosses are known, their existence emphasizing close genetic relationships between species. A unique skin specimen from Australia, collected near Brisbane, in south-east Queensland, in 1867, and which had disappeared by 1950, was considered by some authorities to be a hybrid individual between the Satin and Regent Bowerbirds (*Sericulus chrysocephalus*). A second, living, individual of this hybrid combination was photographed in 2003. Geographically restricted cases of hybridization have also been described, but only recently, as occurring between MacGregor's and Streaked Bowerbirds (*Amblyornis subalaris*) and between the Masked (*Sericulus aureus*) and Flame Bowerbirds (*Sericulus ardens*) in New Guinea, and, in Australia, between the Spotted Bowerbird (*Chlamydera maculata*) and the Great Bowerbird in northern Queensland.

The Satin Bowerbird is the only member of this family found in the fossil record, fossils of this species having been located in the east and south-west of the Australian state of Victoria from the geological epochs of the Pleistocene and Holocene of the Quaternary. These fossils testify to the previously far greater extent of wet forests, of Gondwanan origin, than can be found in present-day Australia, where this habitat is now restricted predominantly to the central-eastern and north-eastern seaboard of the continental island.

At the species level, the Black-eared and Green Catbirds (*Ailuroedus crassirostris*) are clearly closely related, but opinion on whether they constitute two distinct species or are conspecific has been divided. Morphological and geographical considerations, combined with equivocal protein-allozyme data, support their treatment as separate species, probably forming a superspecies. The subspecies *germana* of MacGregor's Bowerbird, found in the mountains of the Huon Peninsula, in north-east New Guinea, appears to build bowers that, at least in some cases, differ from those typical of the species. It has been suggested that *germana* might represent a separate species, the "Huon Bowerbird", but further study is required before such a decision is taken. In the case of Archbold's Bowerbird, living in the central mountain chain of New Guinea, it has for a long time been thought that the two subspecies might constitute distinct species, the adult male of eastern *sanfordi* being crested and building a "mat" bower, whereas the male of the western, nominate race was believed to be uncrested and possibly to build an avenue bower. Further study, however, has now revealed that both subspecies have crested adult males and both construct a maypole bower.

Morphological Aspects

Bowerbirds vary in total body length from 22 cm to 37 cm, and in body shape from being plump and stocky to being slender. The smallest is the Golden Bowerbird, which has an average weight of 80 g, although adult males have a total length longer than that of the *Amblyornis* gardener bowerbirds owing to their possession of a proportionately long tail. The largest is the Great Bowerbird, adults of which have a mean body weight of 200 g. Thus, the most lightweight member of the family has an average weight which is 40% of that of the heaviest. It is well known that, within bird species on the mountains of New Guinea, there is a general increase in body size with increasing elevation, and the bowerbirds broadly reflect this when species are compared. For example, upland Black-eared Catbirds are larger than lowland White-eared Catbirds, and the highest-altitude gardener, MacGregor's Bowerbird, is the largest while the one at the lowest elevation, the Streaked Bowerbird, is the smallest species. Archbold's Bowerbird, living at much higher altitude, is much larger than all true gardeners. Within the silky bowerbirds in the genus *Sericulus*, the upland-dwelling Adelbert (*Sericulus bakeri*) and Masked Bowerbirds are larger than the lowland Flame Bowerbird.

Adult female catbirds are on average nearly 10% lighter in weight than the adult males of the species. In most of the polygynous bowerbird species, the adult females are typically slightly smaller than their respective adult males, but adult females of three of the four *Sericulus* species have a mean size that is the same to slightly larger than that of the corresponding adult males. While most body proportions of adult bowerbird do not differ significantly between the sexes, there are a few exceptions. Adult male Archbold's and Golden Bowerbirds acquire a proportionately longer tail than that of their females, but adult females of the silky bowerbirds, of the Satin Bowerbird and of three of the five *Chlamydera* grey bowerbirds have a proportionately longer tail than that of the respective adult males. Juvenile and immature bowerbirds are generally smaller than subadults and adults of the same species, but there are, again, exceptions. These include younger males of the silky bowerbirds, of the Satin Bowerbird, and of the Spotted and Western Bowerbirds (*Chlamydera guttata*), all of which have an average tail length longer than that of the adults, and this situation is true also with regard to wing length in the case of the Regent Bowerbird. Adult





The avenue-building bowerbirds form one clade, and the maypole-building species another. Of the six maypole-builders, four are gardener bowerbirds, comprising the genus Amblyornis. *Each member of this genus is associated with a distinctive maypole bower form. Except in the* ***Vogelkop Bowerbird****, adult males of the otherwise brown gardener bowerbirds sport silky-textured erectile crests of bright orange or yellow, like that of* ***MacGregor's Bowerbird****. The sexes of the Vogelkop Bowerbird are alike in plumage, the female averaging fractionally smaller. Although the other congeners show sexual dimorphism in the presence or absence of the crest, nevertheless older female Streaked Bowerbirds* (A. subalaris) *may have one or several elongated narrow crown feathers, reminiscent of the male's crest. In MacGregor's Bowerbird, the subspecies* germana, *from the mountains of the Huon Peninsula, appears to build bowers that differ from those typical of other populations of the species. It has been suggested that* germana *might, in fact, constitute a separate species, the "Huon Bowerbird", but further study is required to confirm the details.*

[Above: *Amblyornis inornata*, Arfak Mountains, New Guinea. Photo: Konrad Wothe.

Below: *Amblyornis macgregoriae macgregoriae*, Ubaigubi, EC New Guinea. Photo: William S. Peckover]

males of terrestrially displaying bowerbird species (see Breeding) typically have a shorter tail compared with that of their respective females.

Tarsus length in relation to wing length is typically uniform within a genus, the only obvious exception being that of the Regent Bowerbird. This has a shorter tarsus than that of its congeners, its tarsus measuring 26% of its wing length, compared with 29–30% for the rest of the *Sericulus* species. Bird species with proportionately longer legs are typically more terrestrial in habits, as illustrated by, for instance, the grey bowerbirds, whereas those with shorter legs, such as the Tooth-billed Bowerbird, are more arboreal.

Most members of the Ptilonorhynchidae have a relatively short, deep, robust bill and stout, powerful legs and feet. The four silky bowerbirds, however, are exceptional in having a relatively longer and finer beak, particularly so in the case of the Regent Bowerbird. The Tooth-billed Bowerbird is unique within the family in that it possesses a conspicuous notch, or "tooth", on the cutting edges of its upper mandible and several cusps and notches on the tip and cutting edges of its lower mandible. The bird uses the notched cutting edges to bite or tear leaf pieces and then to fold them into a compact wad prior to mastication; the functional cusps, which fit perfectly into indentations on the other mandible, are employed in a "chewing" action that enhances the digestibility of an item through crushing and grinding it.

The bills of the polygynous species are typically dark brown, blackish or black, but those of adult males of some sexually dimorphic species do display some colour. Adult males of the gardener and silky bowerbird groups have a pale bluish base of the lower mandible, while the entire bill is pale on adult male Satin Bowerbirds and is whitish on all adult catbirds. Adult male Regent Bowerbirds have a bright orange-yellow bill. The mouth colour of adult catbirds is black, but that of adult male Tooth-billed Bowerbirds is black with a sharply contrasting white anterior of the inside of the upper beak; females and immature males of the latter species have the mouth pale yellowish-flesh. The mouth of most other bowerbirds is orange-yellow or yellowish.

Generally, the iris colour of adult bowerbirds is dark to pale brown, that of juveniles being similar but paler and greyer. It is, however, red in adult catbirds and blue-grey in their juveniles. Adult males of the Golden and Satin Bowerbirds, along with the four silky bowerbirds, share a pale iris colour; that of the Satin Bowerbird being blue. While the iris of female silky bowerbirds is typically brown, that of some older individual females of the Regent Bowerbird may have variable amounts of yellow intruding into it. The legs and feet are typically dark brownish, olive-brown, olive, blue-grey or blackish, but those of the catbirds are a paler, brighter grey-blue, and those of the Vogelkop Bowerbird are distinctly blue, while Satin Bowerbirds have a much paler tan leg colour.

Bowerbird species are closely related to one another and, in terms of body proportions, postures, and general appearance, are generally more similar-looking than the member species of many other passerine families. Nevertheless, they do include strikingly diverse plumages. Within Ptilonorhynchidae there are some 50–60 plumages, as most species include a juvenile, an immature and an adult male and female, and some also a distinct subadult male stage. In the case of the catbirds, the Tooth-billed and Vogelkop Bowerbirds and the grey bowerbirds, the adult male and adult female are identical to each other, or nearly so. Thus, both sexes of all catbirds are similarly green above and spotted or streaked green to buff below, with conspicuous black and white facial markings, and both sexes of the Tooth-billed and Vogelkop Bowerbirds are generally brown. Other polygynous species are dramatically sexually dimorphic in plumage, adult males wearing brilliantly coloured feathering, decorated with an ornate crest or cape, while the females are drab. Excluding the Vogelkop Bowerbird, adult males of the other three, and otherwise brown, gardener bowerbirds in the genus *Amblyornis*, along with the all-black Archbold's Bowerbird, sport erectile crests of bright orange or yellow. Unlike closely related species, adult male Golden Bowerbirds are largely brilliant yellow, while the females and immature males are generally greyish-olive. Adult male silky bowerbirds, the *Sericulus* species, are brilliantly dressed in contrasting areas of black and intense reds or yellows, whereas the females and immature males are cryptically plumaged and with ventral barring. Other than being generally green, the plumages of female and immature male Satin Bowerbirds are intermediate in characters between those of the silky and the grey bowerbirds. The five *Chlamydera* grey bowerbirds are generally greyish to brownish.



Most bowerbirds forage alone, in pairs, or in small flocks. The Satin (Ptilonorhynchus violaceus) *and* ***Regent Bowerbirds*** *are exceptional in that they occasionally form aggregations of up to a hundred individuals; indeed, in the case of the Satin Bowerbird, groups may number several hundred birds. These large flocks are particularly associated with winter movements, when both species move to more open habitats in search of food. Usually these flocks are mostly of female-plumaged birds, which may include immature males, though up to 40 adult-plumaged males were observed in one flock. Smaller flocks may be mostly of a single sex.*

[*Sericulus chrysocephalus*, Australia.
Photo: Roland Seitre]





*Rainforest bowerbirds like the **White-eared Catbird** visit creeks and water-filled tree holes in order to bathe or drink. **Spotted Bowerbirds** visit water-holes and cattle troughs in their drier habitats. To maximize time at the bower, males drink water droplets from the forest floor and wet foliage. Water seems to be important for feather maintenance, as well as for drinking. When the Western* (Chlamydera guttata) *and Great Bowerbirds* (C. nuchalis) *are found in suburban gardens, there is usually water nearby. In a study of Tooth-billed Bowerbirds* (Scenopoeetes dentirostris), *males that rarely went more than 60 m from their bowers, travelled up to 400 m to find creeks to drink or bathe. After a brief rain shower, one adult male Golden Bowerbird* (Prionodura newtoniana) *foliage-bathed by flying into a wet sapling and briefly fluttering and hovering among the leaves. Other maintenance activities include preening, anting and sunning. Preening bowerbirds typically head-scratch indirectly, by raising a leg over the drooped wing on the same side, but Golden Bowerbirds also do so also by bringing a leg up directly beneath the wing.*

[Above: *Ailuroedus buccoides stonii*, near Brown River, SE New Guinea. Photo: Brian J. Coates.

Below: *Chlamydera maculata*, near Charters Towers, Queensland, Australia. Photo: Clifford & Dawn Frith]



Males of the polygynous species advertise court or bower sites with special songs and other calls. These include vocal mimicry of other birds' calls, and other sounds from their environments. This ***Tooth-billed Bowerbird*** *is singing from a perch above his display court. The song of this species includes single squeals, screeches and chuck notes, and continuous babbling and mimicry. It is an excellent mimic, and at least 40 bird species, as well as frogs, fruit bats, crickets and cicadas have been identified among the sounds imitated. The Tooth-billed Bowerbird is silent during the winter. By contrast, all three of the socially monogamous, pair-bonding catbird species give their loud cat-like wailing and sneezing territorial songs throughout the year, although with far more insistence during breeding. Among males, the repertoire and quality of mimicry improve with age. Some species, such as the Satin Bowerbird* (Ptilonorhynchus violaceus)*, repeat a repertoire of the calls of other bird species in a specific order, and older males have been found to produce longer bouts of higher-quality avian vocal mimicry than younger ones. Females select the males which perform this mimicry well and also in the preferred order. Vocal mimicry by female bowerbirds at the nest is currently thought to be typical only of the avenue-builders, especially the Satin Bowerbird and the grey bowerbirds. Such mimicry is mostly, but not always, of predatory birds, and also non-avian sounds, including the mewing of cats. These calls could have the function of distracting a predator, or attracting other birds to mob it. They could also be a way of teaching offspring to recognize the calls of predators. Note that the "toothed" indentations on this bird's lower mandible are clearly visible.*

[*Scenopoeetes dentirostris*, Paluma, N Queensland, Australia.
Photo: Marie Read]



Vocal mimicry can be temporary and opportunistic. The male ***Golden Bowerbird*** *is among the species that mimic the call of another species in immediate response to hearing it, or even upon merely sighting an individual. Imitations of at least 20 bird species have been identified in the song and subsong of the Golden Bowerbird, along with mechanical noises. As well as domestic animals and human voices, sounds imitated by bowerbirds may include stock-whips, wood-chopping, Emus* (Dromaius novaehollandiae) *crashing through wire fences, and, increasingly among species in New Guinea, the sounds of chainsaws and of trees falling.*

[*Prionodura newtoniana*, Mount Lewis State Forest, Queensland, Australia. Photo: Günter Ziesler]

Colourful adult male plumage may involve one of several distinctive features. Thus, the four gardener bowerbirds and Archbold's Bowerbird possess an extensive and elongate brightly coloured, silky-textured, erectile crest, and the Spotted, Western and Great Bowerbirds have a similar but short crest restricted to the nape; males of the silky bowerbirds exhibit a strikingly contrasting black and brightly coloured plumage, and those of the Golden and Satin Bowerbirds have a brightly coloured glossy plumage. These features are presented during courtship displays (see Breeding). Forward-pointing loral feathering covers the nostrils of adult male Satin Bowerbirds, an unusual character that makes the bill appear short. This character is shared with some adult male gardeners and the Golden Bowerbird, but not Archbold's Bowerbird.

Juvenile plumage is much like that of the respective adult females, but is slightly duller and softer-textured, and is more barred ventrally in *Sericulus*, *Ptilonorhynchus* and *Chlamydera*, the ten species constituting the avenue-builders. An immature plumage even more like that of the adult female replaces the juvenile one in the first annual moult. In only a few species is this plumage discernible as being that of a young male, rather than that of an adult female.

Males of most perching birds, and possibly including the catbirds, acquire their adult plumage and breed within their first year or two of life. In contrast, males of those polygynous bowerbird species that do acquire brightly coloured adult plumage typically do so at five to six or seven years of age. This may involve some adult plumage colour intruding for a season or two into the female-like immature plumage worn for the preceding five or six years, the result being a subadult plumage, or the full adult plumage being gained by means of a single moult. Thus, promiscuous males of the bowerbirds, like those of other passerines that court at traditional focal displaying sites, exhibit delayed acquisition of visual adult male characters; young male Tooth-billed Bowerbirds, for instance, have a pale mouth interior for four or more years before the black colour typical of adults appears. So, males live among their conspecifics for half a decade or more before any sign of adult plumage becomes apparent. A subadult plumage, if worn, signals that the individual is not yet fully part of the highly competitive adult male community. Such a prolonged period in immature plumage could perhaps enhance a young male's opportunity to move within otherwise aggressive adult male society while gaining valuable experience. Moreover, as immature male plumages are cryptic, the deferral of adult plumage, which may be conspicuously colourful, presumably reduces the risk of attracting predators.

While bowerbirds have ten primaries and six pairs of rectrices, as do most passerines, they appear also to have between 11 and 14 secondaries, including the tertials, but further study is required in order to confirm this for all ptilonorhynchid species. Anything of significance with regard to bowerbird moult is known only for the Satin Bowerbird and, to a lesser extent, the Black-eared Catbird and the Tooth-billed and Golden Bowerbirds. As with most passerines, the primary moult of bowerbirds starts with the first, innermost primary and progresses in an outward direction from the body, simultaneously in both wings, the primary coverts being replaced in the same sequence as that of their corresponding primaries. Moult of the secondaries, including the tertials, begins when the first four or five new primaries are fully or nearly fully grown, again simultaneously in both wings. The tertials are replaced irregularly, and before the true secondary moult is completed. Tail moult begins during the early stages of the primary replacement, and is completed before all primaries have been renewed; it begins with the central rectrices and progresses simultaneously outwards to each side. The moult of the head and body feathers begins before the wing and tail moult commences, often finishing after the flight-feather moult is complete.

Habitat

Most bowerbirds, including the three catbirds, the Tooth-billed, Golden and Archbold's Bowerbirds and the *Amblyornis* gardeners, are predominantly confined to wet forests, or rainforests. The silky group and the Satin Bowerbird also occupy rainforest, but are strongly associated with rainforest edges, and the latter species also with adjacent sclerophyll wet woodlands. The five *Chlamydera* grey bowerbirds are the only real exceptions, as they have adapted to the drier, more open environments of riverine forests, open woodlands, savanna, and forest–grassland communities and, in Australia, to near-desert conditions. Lauterbach's Bowerbird of upland New Guinea and the Fawn-breasted Bowerbird (*Chlamydera cerviniventris*) of lowland New Guinea and extreme north-eastern Australia exhibit a preference for intermediate habitats, typically living at the edges, or within mosaics, of rainforest–grassland and rainforest–woodland communi-



Bowerbirds eat a great diversity of plant and animal foods. The food of adult ***Satin Bowerbirds*** *is mostly fruit and flowers when in season, and some animal food, mainly insects. But during the winter, when less fruit and fewer arthropods are available, leaves form a major part of the diet. This species "chews" leaf matter before swallowing it. During winter months, Satin Bowerbirds can be found in flocks of up to 200 individuals, which fly to pastures to graze on grassy shoots, white clover leaves and herbaceous plants. They also visit gardens, where they sometimes feed on green vegetables.*

[*Ptilonorhynchus violaceus violaceus*, Bunya Mountains, Queensland, Australia. Photo: Raoul Slater]

ties, respectively. In a few cases in which the ranges and habitats of two closely related polygynous bowerbird species overlap, hybridization between them may rarely occur (see Systematics).

In Australia, six ptilonorhynchid species live in the tropics and subtropics, mostly within rainforests at varying altitudes along the eastern escarpments and summits of the Great Dividing Range and the coastal lowlands to the east. The four grey bowerbirds found in Australia inhabit drier habitats predominantly to the west of the Great Divide. Many species are not adverse to exploiting human environments, including suburban parks, gardens, orchards and homesteads, if water and/or suitable foods are available.

It is within the Australian rainforests that most members of this family occur together, both monogamous and polygynous ones being involved. Tropical upland rainforests provide habitat that is shared by the Black-eared Catbird, the Tooth-billed and Golden Bowerbirds, and the small northern subspecies of the Satin Bowerbird. The last three of these are mostly confined to areas of the wet tropics over 600 m above sea-level, where they live sympatrically. The Black-eared Catbird occurs also in lowland areas, including Hinchinbrook Island, off the Queensland coast, and farther north on the eastern Cape York Peninsula. In contrast, the Golden Bowerbird can be found above about 350 m, but far more typically 680 m, and at up to 1260 m on Mount Bartle Frere, at the highest altitude for any bowerbird in Australia.

The Green Catbird shares subtropical rainforest with Regent and Satin Bowerbirds. The Green Catbird and the Regent



Seasonal availability of food, is the most important factor influencing bowerbirds' annual cycles. They do not use their feet to manipulate foods, and therefore eat predominantly fruits of the simple drupe or berry type. Species with overlapping ranges and habitat preferences may select different fruits, or use different forest strata when foraging. The Great Bowerbird (Chlamydera nuchalis)*, which is sympatric with the* ***Spotted Bowerbird*** *in northern Queensland, forages especially in fruiting fig* (Ficus) *trees. The Spotted Bowerbird forages more generally in fruiting trees and shrubs, and also visits gardens.*

[*Chlamydera maculata*, New South Wales, Australia. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]

Bowerbird inhabit primarily rainforest interiors within the subtropics, whereas the Satin Bowerbird there is mostly a rainforest-edge species that lives also in adjacent eucalypt (*Eucalyptus*) sclerophyll forests and woodland. Green Catbirds and Regent and Satin Bowerbirds occur in both subtropical uplands and lowlands, the last-mentioned extending farther south into the temperate rainforests of the Otway Ranges of southern Victoria.

As already seen, the four grey bowerbirds living in Australia inhabit drier tropical and subtropical sclerophyll habitats, mostly west of the Great Dividing Range. Their habitats vary from eucalypt-dominated open forests to woodlands with paperbarks (*Melaleuca*), sclerophyll shrubs and/or a grassy understorey. The landscapes are dissected by river systems lined with denser to sparse riverine vegetation. The Fawn-breasted and Great Bowerbirds are sympatric in the northern Cape York Peninsula of north-east Australia. The Fawn-breasted is essentially a New Guinea species with a small outlier distribution in this extreme north-east part of Australia, where it inhabits pockets and galleries of vine forest, eucalypt woodlands and mangrove–grassland mosaics. At locations where the two species occur together, the Fawn-breasted Bowerbird is more frequently found in mangroves or adjacent *Melaleuca*-dominated habitats, while Great Bowerbirds prefer open woodland. The latter occurs extensively across the Australian tropics, as well as extending farther south in north-eastern Australia, on the east of the Great Divide, where suitable habitat exists. Its bowers are commonly built in riverine vegetation adjacent to riverbeds, which typically dry out seasonally. The Great Bowerbird is sympatric with the Spotted Bowerbird in some areas of northern Queensland where the favoured habitats of the two species overlap.

Spotted and Western Bowerbirds occur in the more semi-arid to arid habitats that extend south from northern Queensland into the subtropics of central and western tropical Australia. Spotted Bowerbirds favour open woodland with low dense shrubbery, under which the males build their bowers. The Western Bowerbird replaces the Spotted Bowerbird in central and western Australia, the former favouring areas close to water, such as river gorges with shady copses and the presence of rock figs (*Ficus platypoda*). Fig-fruit availability may to some extent dictate the distribution of Western Bowerbirds in more arid areas, as figs represent an important food resource.

One or both of the catbird species found in New Guinea may occur together with one or more species of polygynous bowerbird in a single habitat. Four pairs of closely related polygynous bowerbird species meet in parts of New Guinea where their otherwise typically separate altitudinal ranges abut or overlap, and they share the habitat. White-eared Catbirds and Flame Bowerbirds occur mainly in lowland rainforests. The former, a lowland-dwelling species, is replaced in hill forest by the Black-eared Catbird, the two occurring together in some limited areas. The Masked Bowerbird replaces the Flame Bowerbird at higher altitudes of the lower montane forest. The Streaked Bowerbird also lives primarily within the lower montane forest, MacGregor's Bowerbird replacing it at higher elevations of the middle montane forest. Vogelkop and Yellow-fronted Bowerbirds occur primarily in mid-montane forests, as does Archbold's Bowerbird at altitudes above 1750 m. The last-mentioned species occurs mostly above the altitudinal range of MacGregor's Bowerbird, but the two do share habitat in and below Tari Gap, in east-central New Guinea, at least. This higher-lying habitat is often referred to as cloudforest or moss forest, and patches of it are frequently interspersed with grasslands. Archbold's Bowerbird has been observed at 2850–3660 m above sea-level in the Ilaga valley of west-central New Guinea, the highest altitude recorded for any bowerbird.

Bowerbirds are not known to digest seeds, and they therefore serve as highly important seed-dispersers within their habitats, particularly about their courts and bowers, where they spend much time. The selection by bowerbirds of traditional sites for the court or bower and/or for the nest may locally influence habitat choice on a limited scale, and could potentially even bring about localized modification of habitat. Because male bowerbirds defecate large quantities of undamaged seeds around their bower sites, as well as caching entire fruits there for subsequent consumption (see also General Habits), it is conceivable that they indirectly propagate foodplants immediately around more traditional bower locations. As such sites pass from one male generation to the next, a local abundance of food would thus enable males to spend more time close to their bowers. Court-owners and bower-owners at such resource-rich sites would benefit in terms of the potentially maximized visitations by foraging females. Females may, in turn, nest close to traditional courting sites because of the local abundance of food, which they require in order to provision their offspring. This hypothetical scenario could create and enhance ecological "hot spots" within the habitat, males seeking these sites as preferred bower locations.



Flowers are taken by all species. They make up a larger proportion of the diet of subtropical than of tropical forest species, perhaps reflecting the greater variety and availability of fruit in the tropics. In drier habitats, Spotted (Chlamydera maculata) *and Western Bowerbirds* (C. guttata) *eat the flowers of acacia trees. The* ***Tooth-billed Bowerbird****, which eats a typical bowerbird diet of fruits, flowers, leaves and insects during the display season, is a leaf specialist in winter, when it spends long periods among dense canopy foliage, keeping silent and flying little. Its "toothed" bill enables it to tear, manipulate and masticate pieces of leaves and stems before swallowing them.*

[*Scenopoeetes dentirostris*, Australia. Photo: Roland Seitre]



*The **Regent Bowerbird** has a longer, finer bill than most bowerbirds, and is something of a nectar specialist. It also catches arthropods, primarily by gleaning and hawking. Arthropods form a significant part of the diet of adult and young bowerbirds. While bowerbirds obtain some of their insect prey, such as flying termites, by sallying, snatching or hawking, more typically they forage by searching and gleaning on live and dead foliage, tree branches and trunks, epiphytes, flowers, and forest-floor leaf litter. Large insects such as grasshoppers and beetles are carried to the ground, shaken and knocked violently to remove the wings, and torn to pieces.*

[*Sericulus chrysocephalus*, Kempsey, New South Wales, Australia. Photo: David Stowe]

Catbird pairs and the females of polygynous bowerbirds habitually use the same location, and often the same immediate site, in which to build the nest each year. Such traditional nesting possibly reflects local habitat suitability and/or limited availability of suitable sites. In addition to the excreting of intact seeds, the two catbird species in Australia, and possibly all catbird populations, store fruits, particularly figs. Again, this behaviour may result in the propagation of favoured foodplants within their traditional all-purpose territories, and perhaps specifically more so about traditional nesting sites (see also General Habits).

General Habits

For bowerbirds, the establishment of and attendance at the court or bower, as well as courtship, mating, nesting and moult, are in large part governed by climate. This is reflected in the relative availability of resulting food resources, both fruit crops and the abundance of arthropod populations, which are critical to sustaining birds through these energetically demanding aspects of their annual life cycles.

The annual cycles of bowerbirds in New Guinea are little understood, not only because information is limited but also because of the great variation in climatic regimes existing over their geographical and altitudinal ranges. Much more is known about the Australian species, particularly about those living in humid tropical and subtropical rainforest. Here, for the two species of catbird and the Tooth-billed, Golden, Regent and Satin Bowerbirds, the courtship and nesting seasons start as annual temperatures initially rise, typically during August to early September, although males may commence activity at bowers as early as June–July, especially at lower, and thus warmer, altitudes. The peak in courtship and nesting activity is mostly during late September to December, when temperatures and rainfall increase and when fruit, flying insects and forest-floor leaf-litter invertebrates are most abundant. Activities at bowers and nests terminate with the onset of heavy wet-season rains, the nestlings leaving the nests immediately before or during the early wet season. Food resources remain abundant during the wetter months, this period coinciding with that in which the female parents or, in the case of the catbirds, both parents are provisioning fledglings. Annual moult of the adults takes place mainly during December to March, reaching a peak during the wetter months of January to March, after the young have departed from the nests. Towards the end of the moult, immediately prior to the annually drier, cooler and leanest period within these habitats, the body weight and fat levels of bowerbirds increase.

Far less is known about the life history and cycles of the grey bowerbirds, which live in more open habitat, other than the fact that the display and breeding seasons are strongly influenced by seasonal, and far less predictable, rainfall. The peak nesting period for Australian grey bowerbirds typically precedes the annual monsoonal rains, during October to December or January, but this varies from year to year. Initial monsoon rains bring about a greater abundance of insects, mainly grasshoppers (Orthoptera), which primarily stimulate nesting by grey bowerbirds as they represent a large proportion of the diets of these species' nestlings. The availability of fruits of the rock fig may also be important in many areas (see also Food and Feeding). Hatching of the eggs coincides with the peak seasonal availability of larger insects. Typically, grey bowerbirds moult towards the end of the calendar year, following courtship and nesting. Some individuals, however, shed the wing and tail feathers at other times of the year, suggesting the possibility of overlap between their annual breeding and moult cycles, unlike the situation with the rainforest-dwelling species.

Aside from foraging, rainforest bowerbirds visit creeks and water-filled tree holes in order to bathe or drink, whereas grey bowerbirds visit water-holes and cattle troughs in their drier habitats. Males also drink water droplets from forest-floor leaf litter and wet foliage around their bower sites.

Maintenance activities have been recorded for several members of the family. After a brief rainshower, one adult male Golden Bowerbird indulged in foliage-bathing by flying into wet sapling foliage and briefly fluttering and hovering among the leaves. Other maintenance activities include preening, anting and sunning. Preening bowerbirds typically head-scratch indirectly, by raising a leg over the drooped wing on the same side, but Golden Bowerbirds, at least, do so also by the direct method, bringing a leg up directly beneath the wing to the head. Anting, involving the use of live ants (Formicidae) to anoint the feathers, is a relatively rarely observed activity of wild birds, but Tooth-billed, Golden and Satin Bowerbirds, at least, have been recorded as carrying out this type of behaviour.

Sunning is a well-known, widespread, but little-understood aspect of avian behaviour, one which has been observed for only a few bowerbird species. Adult male Black-eared Catbirds and Golden Bowerbirds occasionally adopt a sunning posture, with

the feathers of the breast, rump, head and nape erected, the tail pressed down and the wings drooped, when direct warm sunlight strikes them. One particularly interesting observation involved an aggregation of eight adult male and at least six "female-plumaged" Regent Bowerbirds which sunned themselves upon a semicircular area of 5 m by 1·5 m of open, and directly sunlit, leaf litter and on leafy perches above this. At any one time, up to eight of these individuals were squatting or lying on the litter in typical passerine sunning postures, this activity lasting for up to 15 minutes.

Catbird pairs cache fruits, as do the males of several polygynous bowerbirds, including MacGregor's, Golden and Great Bowerbirds, the stored food destined to be eaten at some future time. Their cache sites are unmodified tree crevices and branch forks, points of contact between epiphytic vines and trees, horizontal branches or large vines, the tops of tree stumps, fallen logs, the crowns of tree-ferns, crevices between fig roots, and similar suitable places. Golden Bowerbirds cache fruits also among forest-floor litter and beneath fallen timber. When first stored, fruits are usually ripe, but they may sometimes be unripe, and they occasionally rot or their seeds germinate (see also Habitat) at the cache site if they are not retrieved by the bird. The storing of fruits may function in maximizing the time that such food-caching males can spend at their bower site. There is no evidence to suggest that cached fruits serve as bower decorations, but some male Golden and MacGregor's Bowerbirds do "store" bower decorations around their bower sites.

Adult bowerbirds are preyed upon by diurnal and nocturnal raptors. As a consequence, they assume an anti-predator posture when they catch sight of a predator nearby. This generally involves nothing more than freezing on the spot, remaining perfectly motionless until the danger has passed.

The flight of these species is strong and purposeful and, over greater open areas, is conspicuously undulating. In normal flight the wings can produce an audible rustling sound, and the males of some species, when flying about their bowers, may produce a loud wing noise. Flights to fruiting trees are typically rapid and undeviating, the bower-owning males flying directly between their bowers and the feeding trees, and parents directly between their nests and the trees. Courtship flights are performed by a few species, the most remarkable being the butterfly-like Flight-hover display of the Golden Bowerbird; some simplistic "flight" displays between adjacent vertical saplings are performed by *Amblyornis* species (see Breeding).

Voice

All three of the socially monogamous, pair-bonding catbird species give loud cat-like wailing and sneezing territorial songs throughout the year, although far more so when breeding. The peak periods of their daily calling are in the early morning and the late afternoon. In addition, the individuals of pairs maintain contact by various sharp, high-pitched "tic", "tick", "tink" or "chink" notes. Vocal mimicry has not been reported for any catbird, either at or away from the nest and, since detailed studies of these species have been undertaken, it is unlikely that they ever do indulge in mimicry. Parent catbirds disturbed at the nest produce harsh scolding notes.

Males of the polygynous species advertise court or bower sites with special songs and other calls, including vocal mimicry of other bird calls and other sounds of their environments. These vocalizations are delivered from habitually used perches, typically immediately above or about the court or bower. Promiscuous adult males advertise the location of their court or bower mostly in the early morning and late afternoon, but by no means exclusively so during peak courting months. The Regent Bowerbird is unusual in that the males advertise bower locations from the forest canopy, and it is possible that other species in the *Sericulus* silky bowerbird group do likewise. Typical songs and calls of the polygynous species consist of variable far-carrying harsh, jarring, churring, chugging, rattling sounds, or deep and hollow whistled notes. Exceptions are the typical advertisement call of male Satin Bowerbirds, which is a clear, pleasant, briefly whistled song, and the distinctive prolonged rattle of male Golden Bowerbirds.

Promiscuous males perform vocal mimicry not only in court or bower advertisement, but also during courtship or upon seeing a potential predator. This may include imitation of the calls of other bird species, including those of predatory birds, and also of other environmental sounds, such as those made by domestic animals and by humans, and even human speech. During court-



Although adapted to drier habitats than other species in the family, grey bowerbirds like the ***Fawn-breasted Bowerbird*** *need to drink regularly. The four grey bowerbirds found in Australia will exploit human environments, including parks, gardens and homesteads, if food and water are available. Bowerbirds are not known to digest seeds, and they serve as important seed dispersers. By defecating large quantities of viable seed, it is possible that males help create a local abundance of suitable food plants around the long-term sites of bowers, which enables them to maximize time at their courts, and may in turn attract females to visit and nest.*

[*Chlamydera cerviniventris*, near Brown River, SE New Guinea. Photo: Brian J. Coates]



The three catbird species form long-standing monogamous pairs within an all-purpose territory. Courtship in the ***Black-eared Catbird*** *involves little more than hopping excitedly about perches by both partners, the male sometimes giving sharp calls. He often holds food in his bill, which he may pass to the female after mating. The dispersion of suitable fruiting trees is the key to the monogamous reproductive system of the catbirds. Figs* (Ficus) *form a significant component of the diet of both adults and nestlings. Fig trees tend to be relatively evenly dispersed throughout catbird habitats, providing predictable fruit crops, and a viable basis for territory-based pair-bonding.*

[*Ailuroedus melanotis maculosus*, Atherton Tableland, Queensland, Australia. Photo: Clifford & Dawn Frith]

ship, the males produce a soft, often continuous subsong of high-quality vocal avian mimicry. There is little doubt that males, if not also females, of all polygynous bowerbird species are competent mimics, and MacGregor's, Streaked, Vogelkop, Archbold's, Golden, Regent and Satin Bowerbirds, as well as all of the *Chlamydera* grey bowerbirds, are confirmed as being such. Moreover, vocal mimicry can be opportunistic, and male bowerbirds will mimic the call of another species in immediate response to hearing it, or even upon merely sighting an individual.

Vocal mimicry is fundamentally an aspect of behaviour acquired by learning and can, therefore, be passed on culturally. The relative age of males would appear to play a significant role in this, as both the repertoire and the quality of vocal avian mimicry improve with age. Among competing Satin Bowerbirds, for example, older males were found to produce longer bouts of higher-quality avian vocal mimicry than younger males, and as a consequence they gained higher mating success. When producing high-quality mimicry during courtship, male Tooth-billed and Satin Bowerbirds repeat a repertoire of the calls of other bird species in a specific order. The males must, therefore, remember both the bird calls and the sequence in which they are to be produced, as must the females, which preferentially select those males performing this mimicry well and in the preferred order. It appears clear, then, that sexual selection by females acts upon this form of vocal avian mimicry by bowerbirds to improve the males' song repertoire and quality.

At the present time, vocal mimicry by female bowerbirds at the nest is reported as typical only of the avenue-builders, and especially of the Satin Bowerbird and the grey bowerbirds. Such mimicry is mostly of predatory birds, evidently as a form of defence, but calls of apparently non-predatory birds have also been noted under such circumstances, as has the imitation mimicry of non-avian sounds. The latter imitations include a cat-like meowing by females of the Spotted, Western and Great Bowerbirds near their nests, cats being, of course, another potential predator.

It is conceivable that the mimicking by female bowerbirds near their nests of the calls of aggressive and predatory birds, and the same behaviour by males near their bowers, may in fact have the function of distracting a potential predator, which hears a call apparently given by one of its own kind. On the other hand, it could function in attracting other birds, which may then, in turn, mob the visiting predator. Another possibility is that, in mimicking calls of potential predators, as they approach, a female provides her nestlings with a species-specific alarm that any surviving offspring can associate with a specific danger, thereby increasing her own fitness by improving the chances of her offspring's survival.

Food and Feeding

Bowerbirds eat a great diversity of plant and animal foods. The seasonal availability of food resources, particularly fruit, is the most important factor influencing distances over which bowerbirds travel from their bowers and nests, their annual cycles, and their mating systems. Fruit forms the major part of the plant diet of these birds, but flowers, including buds, petals, stamens and nectar, and leaves, including buds, shoots, stems and petioles, are also consumed in various quantities, as are seeds and sap. In tropical rainforests, fruits represent 80–90% of the diets of Black-eared Catbirds and Tooth-billed and Golden Bowerbirds. Green Catbirds and Regent and Satin Bowerbirds, dwelling in subtropical rainforests, eat fewer fruits, which make up 65–80% of their diets, while their intake of flowers, leaves and/or animals is larger than that of tropical-rainforest bowerbirds. This difference could reflect the fact that there is a greater diversity of suitable fruits in tropical rainforests than is available in subtropical ones.

Selection of foods, primarily various combinations of fruits, and to a lesser extent the use of differing vertical forest strata and foraging sites, and/or behavioural differences, all result in ecological isolation, or niche differentiation, between sympatric rainforest-dwelling bowerbird species. Bowerbirds select fruits on the basis of their nutritional value, size, texture or colour, or the ease with which they are harvested. They utilize primarily those of the simple drupe or berry structural type, and figs, as opposed to better-protected capsular fruits, for which greater effort and manipulative skill are required, although these are consumed to some extent. Bowerbirds do not use their feet to hold and manipulate foods, and they are therefore unable easily to extract the edible "reward" from the protective husks of capsular fruits. Certainly, bowerbirds typically take arillate seeds from capsules





The brightly coloured ***Masked Bowerbird*** *builds a neat but relatively simple avenue bower, which it decorates with up to six blue or purple fruits, black bracket fungus, snail shells, and yellow to bronze leaves. The plain brown* ***Vogelkop Bowerbird*** *builds two different kinds of maypole bower in different parts of its range. In the Tamrau, Arfak and Wandammen Mountains in New Guinea, the bower is a complex hut-like structure 1–1·5 m tall and 2m in diameter. The roof may be formed of sticks or fern fronds, or more usually epiphytic orchid stems. The base of the sapling "column" is covered with moss that extends down and out to form a frontal mat or lawn. Mats may be decorated with discrete piles of different-coloured items. The Vogelkop Bowerbird lacks the bright yellow-orange crest of its congeners. MacGregor's* (Amblyornis macgregoriae) *and Yellow-fronted Bowerbirds* (A. flavifrons), *with their colourful crests, build relatively simple bowers. According to the "transferral effect" hypothesis, males of less ornate species of otherwise conspicuously crested bowerbird genera have lost the crest as they simultaneously evolved more complex bowers. Presumably these differences arose as a result of sexual selection by females for meaningful, externalized symbols of male fitness, namely the bower and its decorations. However, the populations of the Vogelkop Bowerbird in the Fakfak and Kumawa Mountains build a simple roofless structure similar to that of MacGregor's Bowerbird.*

[Above: *Sericulus aureus*, Irian Jaya. Photo: Mike Potts/ naturepl.com.

Below: *Amblyornis inornata*, Arfak Mountains, New Guinea. Photo: Konrad Wothe]

after dehiscence, when the seeds are more easily accessible. A significant complication when assessing the nutritional content of fruits is the possible presence within them of insect larvae, because these can considerably augment the protein intake of frugivores.

The dispersion of suitable fruiting trees within the habitat is of great significance in understanding the differences between the monogamous reproductive system of the catbirds on the one hand and, on the other, the system of the polygynous bowerbirds. Fig fruits form a significant component of the diet of both adult and nestling catbirds. Fig trees are relatively evenly dispersed throughout catbird habitats in Australia, and present spatially and temporally predictable fruit crops: they provide a viable ecological basis for territory-based pair-bonding, which characterizes social monogamy. Unlike catbirds, however, polygynous bowerbirds feed mainly on highly nutritional drupaceous fruits of numerous plant species, the crops of which ripen over a longer period and are less evenly dispersed than are figs. Thus, the catbird system of a defended and exclusive all-purpose territory could not work for the primarily fruit-eating polygynous bowerbird species because, while a defended area may contain one or more fruiting trees in one month, it may have none in the next. Seasonal abundance of rainforest fruits allows court-owning and bower-owning male bowerbirds emancipation from nesting duties (see Breeding).

Bowerbirds typically forage alone, in pairs, or in small aggregations or true flocks, but Regent and Satin Bowerbirds are exceptional in that they occasionally form flocks of up to one hundred or, in the case of the latter species, up to about 200 individuals (see also Movements). The Ptilonorhynchidae are for the most part arboreal, foraging in the canopy and down to subcanopy foliage, branches, epiphytes and trunks. They do, however, also seek food on the ground, typically in forest leaf litter, especially the catbirds and the Satin Bowerbird.

The members of this family obtain fruits mostly while perching upright, or while leaning forwards or sideways to pluck and swallow the fruit whole and *in situ*. They may take several fruits during a single feeding bout. Some species, especially the Golden Bowerbird, will sally for fruits, snatching them while in flight; this method is used particularly for those on vines or for capsular fruits whose split husks expose the ripe contents. Large ripe fruits, such as those of some figs and climbing pandans (*Freycinetia*), may be torn apart and eaten on the spot. A few larger fruits, or bunches of smaller ones, are plucked and carried in the bill to a branch within the feeding tree, to be eaten there, or are taken away and stored for later consumption (see General Habits).

Australian bowerbirds swallow entire flowers, or their petals, buds, stamens, pollen or nectar, immediately where they seize them. The Regent Bowerbird includes a large proportion of flower product in its diet, taking mostly nectar; its longer, finer bill is better adapted to nectar-eating than those of other bowerbirds. Satin Bowerbirds feed on *Banksia* and *Grevillea* nectar and that of many herbaceous plants. In drier habitats, Spotted and Western Bowerbirds eat the flowers of acacia trees (*Acacia*). With the possible exception of the Golden Bowerbird, all of the Australian species eat some leaf material, as well as succulent leaf buds, stems and/or vine tendrils. Leaves form a major part of the diet of Tooth-billed and Satin Bowerbirds during the winter months, when fewer fruits and arthropods are available. The specialized bill of the Tooth-billed Bowerbird (see Morphological Aspects) enables it to tear, manipulate and masticate pieces of leaves and leaf stems. During the winter, this species remains among dense canopy foliage, keeping silent and flying little, and it is then predominantly leaf-eating, or folivorous. With the return of spring and summer, when fruits again become abundant, Tooth-billed Bowerbirds revert to a mostly frugivorous diet. Similarly, Satin Bowerbirds eat much more foliage during the winter, and "chew" leaf matter before ingesting it, but they have an only slightly notched bill. Black-eared Catbirds and Satin Bowerbirds will occasionally consume tree sap, but seed-eating by bowerbirds is rare, there being just a few records of this for the Green Catbirds and the Regent, Satin, Spotted and Great Bowerbirds.

Arthropods, mostly insects, form a significant part of the diet of adult and young bowerbirds, especially during courtship and nesting periods. Insect groups widely exploited by this avian family include grasshoppers and their relatives (Orthoptera), cicadas (Cicadidae), beetles (Coleoptera), caterpillars, ants (Formicidae), cockroaches (Blattodea), mantids (Mantodea) and stick-insects (Phasmida). When one of these birds captures a larger cicada, it typically carries it in its bill to the ground, where it shakes and knocks off the insect's wings and tears its body into small pieces for eating. Flying termites (Isoptera) are also eaten by ptilono-



*As an alternative to thatched hut-like or tepee-like structures, a maypole bower may consist of a perfectly circular mossy "bowl" with a roughly conical central tower of sticks, up to 3 m tall, like this **MacGregor's Bowerbird** bower. Traditional maypole-bower structures may, with seasonal renovations, persist for more than 20 years. At the beginning of a season, males typically renovate and add to their maypoles of the previous season. The typical bower "style" of a species is partly learnt, and the significant geographical variation in structures, especially as seen among isolated populations of MacGregor's and Vogelkop Bowerbirds, is a reflection of such actively transmitted behaviour.*

[*Amblyornis macgregoriae kombok*,
Tari Gap, New Guinea.
Photo: Clifford & Dawn Frith]

rhynchids, and worms (Annelida), frogs (Anura), skinks (Scincidae), and pieces of birds and their eggs are also included in the diet of some bowerbirds. The members of this family obtain some of their arthropod prey by snatching or sallying, or take them in the air by hawking. More typically, however, they forage for invertebrates by searching and gleaning in such places as live and dead foliage, tree branches and trunks, epiphytic plants, flowers, and forest-floor leaf litter.

The relative proportions of fruits and animals fed to nestlings vary from one ptilonorhynchid species to another. Nestlings of the rainforest species are fed with a greater proportion of fruit, but the nestling diet of the drier-country grey bowerbirds contains slightly less fruit than it does arthropods. Of the animal items fed to nestling bowerbirds, insects are the most important. Females of each polygynous bowerbird species tend to feed the young with a single animal type, such as cicadas, grasshoppers or skinks, as the dominant component of their nestlings' diet. Cicadas and beetles are foods of major importance to adult and nestling forest-dwelling bowerbirds, whereas orthopterans, particularly grasshoppers and locusts (Acrididae), are more important to the grey bowerbirds of drier habitats.

When provisioning their young, parent bowerbirds carry food items along the length of the bill and in the mouth. Unlike the birds-of-paradise, they do not regurgitate them. Both fruits and animals are fed to nestlings of all ages. In the case of predominantly frugivorous parents, the proportion of insects which they feed to their nestlings is greatest in the period just after hatching, and declines thereafter. Once nestlings reach a certain age, however, their dietary needs can probably be provided for by a selection of fruits, some of which are relatively rich in protein and lipid.

During the display and breeding seasons, one to several individuals of a bowerbird species may forage in the canopy of a single fruiting tree, especially a fig tree. Bowerbirds will often feed alongside individuals of other bowerbird species, and other fruit-eating bird species, such as fruit-doves (*Ptilinopus*), but typically they interact little with other foraging birds, although they may occasionally displace them. Aggressive encounters between foraging individuals of a species do occur, but rarely. Regent Bowerbirds are the most aggressive and the most successful in displacing other fruit-eating birds that are attempting to feed in the same tree, including larger species such as Green Catbirds and Satin Bowerbirds, as well as Topknot Pigeons (*Lopholaimus antarcticus*).

Breeding

All three catbird species are socially monogamous, pair-members reproducing together for one or more years within a defended all-purpose territory. Male catbirds do not participate in the tasks of nest-building, incubation of the eggs and the brooding of the nestlings, but they do assist in provisioning the mate and offspring with meals. Catbirds have no court or bower, and their courtship is simplistic. Males hop rapidly back and forth between perches, usually with food in the bill, with no ritualized posturing. They appear not to use their dark mouth pigmentation in courtship displays.

The remaining 17 bowerbird species are polygynous, each promiscuous adult male using advertisement calls and/or colourful plumage to attract females to his court or bower site, where he courts and mates with as many females as possible during each breeding season. Females of these polygynous species undertake the tasks of nest-building, incubation of the eggs, and brooding and provisioning of the offspring entirely alone, unaided by the father. The sophisticated actions of building, decorating, collecting, arranging, thieving, singing, posturing and dancing of promiscuous males at their court or bower are all designed primarily to attract and impress females so that the male may mate with them before they go to nest.

With regard to polygynous species, it is important that the word "bower" be applied only to structures that the birds physically build. The Tooth-billed Bowerbird court is an area of ground that is merely cleared of litter, and does not involve any construction. The remaining 16 polygynous species build a bower, of which there are two basic structural types: maypoles are constructed by members of the genera *Amblyornis*, *Archboldia* and *Prionodura*; and avenues are built by *Ptilonorhynchus*, *Sericulus* and *Chlamydera* species. Courts and bowers are cleared or built and maintained only by male bowerbirds, and they have nothing to do with nests and nesting. A court or bower may be cleared or built at the precise spot upon which that of the previous season



*Male **Macgregor's Bowerbirds** are non-territorial except in defence of the bower. These two males are keeping the maypole between them, in a manner reminiscent of the "hide-and-seek" courtship display of this species. Traditional bower sites are chosen for their advantageous positions, and are well known to females, which may return to a bower where they have been courted. The incumbent male may occupy a site for up to 20 years, presenting a formidable challenge to younger males. Unless the older male dies or disappears, the aspirant will have to confront him in his bower. Males with established bowers may also challenge others to improve their location or status.*

[*Amblyornis macgregoriae kombok*,
Mount Giluwe,
EC New Guinea.
Photo: Brian J. Coates]

was situated, or it may be located on a different spot but within the same traditional court or bower site. Courts and bowers are not situated randomly within habitats, but are on spots having favoured topography and with immediate environmental features that include one or more of the required characteristics. These could involve appropriate foodplants, saplings, perches, light conditions, foliage cover, and similar criteria. To date, this aspect has received little attention from ornithologists.

The location of a court or a bower is referred to as a "site", the court or bower site of a male representing the focal point upon which almost all sex-related activities of adult and immature males and females are concentrated. Sites may be "traditional" ones, persisting for years and potentially up to many decades, or rudimentary ones, which rarely persist for more than a single season. Unlike the structures of bower-building species, the traditional courts of Tooth-billed Bowerbirds are not so evenly dispersed but, instead, exhibit a tendency to be clumped and thus potentially to form exploded leks. Studies suggest that male Tooth-billed Bowerbirds holding traditional sites at the heart of an aggregation of courts are older and more dominant individuals, with higher mating success than that of their peripheral rivals. The advantages to a male of taking over a longer-term, centrally located, traditional court site would, therefore, involve improved status for him and the possibility that females may return to the site where they were previously successfully courted. The latter holds true also for the traditional bower sites of the bower-builders. For all species studied, traditional bower sites are evenly dispersed through suitable habitat, the fairly regular distances between them being maintained by the social interactions of competitive males. As a result, court and bower sites and, in the case of some maypole-builders, even specific structures are attended by generations of males.

Before acquiring adult plumage, some older immature or subadult males may establish rudimentary sites by clearing an inferior court or by constructing a crude bower, typically located close to a traditional one. The young male, however, attends such a site only irregularly, and abandons it once he is evicted by a locally resident adult male or when he acquires a traditional site of his own. Studies of Tooth-billed, MacGregor's, Archbold's, Golden, Regent, Satin, Spotted and Great Bowerbirds suggest that female-plumaged, immature males undergo an "apprenticeship" of 5–6 years, spent in visiting rudimentary, or practice, courts or bowers of their own making, as well as the bowers of older males, while gaining experience of decorating and thieving, building, bower attendance, displaying and vocalizing, before attempting to establish or take over a traditional site. Once a male has established occupancy of a site, he can ill afford to be deterred from attending and defending such a hard-won asset that is so fundamental to his potential reproductive success, and males do, indeed, exhibit extremely high fidelity to sites.

Male Tooth-billed Bowerbirds clear a forest-floor court and then decorate it with leaves, placed with the paler underside facing upwards. Each court encompasses the trunk of at least one small tree as a "display tree". The maypole-builders accumulate numerous orchid stems or sticks and stack them around a vertical sapling or tree-fern trunk(s), or upon horizontal perches above a bower "mat" made of mosses, rootlets or fern fronds. Piles of bower decorations are placed on this mat. Maypole bowers include diminutive thatched hut-like or tepee-like structures of orchid stems, sticks or mosses and perfectly circular mossy "bowls" with a roughly conical central tower of sticks.

There are three basic maypole types. A simple tower of sticks is built by Golden, MacGregor's and Yellow-fronted Bowerbirds and by the Fakfak and Kumawa Mountains populations of the Vogelkop Bowerbird. The Streaked Bowerbird and the populations of the Vogelkop Bowerbird living in the Tamrau, Arfak and Wandammen Mountains construct a roofed tower of sticks. The third basic type is the dispersed maypole of Archbold's Bowerbird. Golden Bowerbird bowers consist of one or two tall and bulky stick towers, usually terrestrial, but these are uncommonly arboreal, with the bower perch up to 2 m above the ground. That of Archbold's Bowerbird is an amorphous structure that may reach up to 2 m above the ground and occupy a large surface area and volume. Maypole bowers, particularly those of Archbold's and Golden Bowerbirds, are individually more variable in size, design and materials than the bowers of avenue-builders. Traditional maypole-bower structures may, with seasonal renovations, persist for more than 20 years. At the beginning of a season, males typically renovate and add to their maypoles of the previous season.



*The **Streaked Bowerbird** builds and decorates a complex, tepee-shaped maypole bower. The bower has back and side walls, and a semicircular tunnel-like passage around the maypole column, with entrances on either side, facing the front. Decorations used by this and other rainforest bowerbirds include flowers, fruits, fungi, lichens, seedpods, beetle wing-cases and other insect debris, feathers and bones. Precisely where on bowers the decorations are placed is, with some individual variation, characteristic of each genus and species.* Amblyornis *gardener bowerbirds typically decorate their bower mat and maypole-column base. The Streaked Bowerbird also decorates the parapet in front of the mat.*

[*Amblyornis subalaris*, New Guinea. Photo: Clifford & Dawn Frith]





*This **Vogelkop Bowerbird** bower is of the more elaborate hut-like type, for example built by the Arfak mountain population of this species. The bower mat is decorated with fruit, fungi and some discarded human artefacts, sorted into discrete piles according to size and colour. Males strongly favour items of a certain size, shape, texture and colour for their bower decorations. Regardless of location and decoration type, male Vogelkop Bowerbirds have been found to favour blue, black and orange objects. Although the males of some species, such as the Regent Bowerbird* (Sericulus chrysocephalus), *use only one or a few kinds of decoration, most species use many kinds. The relative abundance of decorations enables females to assess the quality, or fitness, of individual males. The colour and quantity of decorations vary from one Vogelkop bower to another, and males steal items from each other, and indeed will also destroy one another's bowers. Recent research suggests that females of some species may select those males that use decorative items that in natural conditions are rare.*

[Above: *Amblyornis inornata*, Arfak Mountains, New Guinea. Photo: Konrad Wothe.

Below: *Amblyornis inornata*, Irian Jaya. Photo: Richard Kirby/ naturepl.com]

An avenue bower typically consists of two walls of sticks or grass stems placed parallel to each other and nearly vertically into a foundation mat of sticks and or grasses laid upon the ground. The bowers of the *Sericulus* silky bowerbirds are small, frail and sparsely decorated avenues, while those of the Satin, Western, Spotted and Great Bowerbirds are increasingly larger, stronger and more decorated, respectively. The basic avenue bower of the Fawn-breasted Bowerbird is enhanced by the fact that it is built upon a raised, and sometimes conspicuously substantial, basal platform of sticks. That of Lauterbach's Bowerbird, beyond being built on a raised basal platform, is further elaborated upon by the addition of two walls at right angles to those of the central avenue, forming more of an open-topped box-like structure.

Avenue bowers of the Satin Bowerbird and the *Chlamydera* grey bowerbirds are refurbished and reused or are replaced at their traditional sites annually. In marked contrast, two-thirds of the bowers of Regent Bowerbirds are maintained for fewer than eleven days. It is thought that this is because, if intruding males do not destroy the bowers of rivals, the bower owners, having become aware of the discovery by rivals, typically destroy or abandon their own bowers. Some avenue-builders have their bower structures influenced by the activities of males of another species. This rare and geographically limited situation is known to have involved pairs of Regent and Satin Bowerbirds, Satin and Spotted Bowerbirds, and Spotted and Great Bowerbirds in Australia and, in New Guinea, Lauterbach's and Fawn-breasted and probably also MacGregor's and Streaked Bowerbird and Masked and Flame Bowerbird pairs in New Guinea.

In the case of those species that decorate an extensive area at one or both ends of an avenue bower, the avenue formed by the two walls of such bowers is very often aligned to a particular compass orientation, usually north–south. This orientation enhances illumination of the bower decorations and male courtship displays, as viewed by females from within the bower avenue.

The typical bower "style" of any particular species is partly learnt by individuals, and the significant geographical variation in structures that has been noted, especially among geographically isolated populations of MacGregor's and Vogelkop Bowerbirds, is a reflection of such culturally transmitted behaviour. Typically, only leaves are used in decorating Tooth-billed Bowerbird courts. Among other things, leaves are used as bower decorations by several maypole-builders and avenue-builders. Other polygynous species decorate their bowers with a broad array of natural and, when available, man-made objects. Decorations used by rainforest bowerbirds include flowers, fruits, fungi, lichens, seedpods, insect frass, insects and their cast old exoskeletons, feathers, bones, and mammal skulls. The grey bowerbirds favour paler decorations, such as bones, stones, shells and glass. Natural experiments at bowers demonstrate that males of different species favour different colours or objects, such as mammal skulls, mammal dung, snail shells, beetle wingcases, orchid flowers, tree resin, parrot (Psittacidae) feathers and so on.

Precisely where on bowers the decorations are placed varies among the species and is, with some individual variation, characteristic of each one. Males show great discrimination in the matter of where and how their decorations should appear. Gardener bowerbirds, constituting the genus *Amblyornis*, typically decorate their bower mat and maypole-column base, some also hanging insect frass from the ends of lower maypole sticks. Items are often placed on the bower mat in discrete piles, while some are put on perches above the bower area. Grey bowerbirds, in the genus *Chlamydera*, lay certain items in discrete piles on particular parts of the bower or immediately around it. Regent Bowerbirds, and perhaps other species in the *Sericulus* silky bowerbird group, put decorations almost exclusively on the floor of the bower avenue, whereas Satin Bowerbirds place them only on the platform outside the avenue entrance.

Males strongly favour items of a certain size, shape, texture, and/or colour for bower decorations. Although the males of some species use only one or few kinds of decorations, as do, for example, Regent Bowerbirds, those of most species use several to numerous kinds. Such decorations can be present in numbers greater than 5000 on a single grey bowerbird bower. The relative abundance of decorations enables females to assess the quality, or fitness, of individual males on the basis of their relative success in conflict with rival males, as rivals steal decorations from one another. Some recent research suggests that females of some species may select those males which use decorative items that are rare in nature. Other recent work revealed that the decorations most favoured by one population of male Satin Bowerbirds



Maypole bowers are individually more variable in size, design and materials than the bowers of avenue-builders. Those of the ***Golden Bowerbird*** *are particularly variable, consisting of one or two tall, bulky stick towers built around a pre-existing perch consisting of a woody vine, sapling, fallen branch or tree root. The perch is used both by the displaying male and the visiting female. The bower may be at ground level or, more rarely, in the trees, with the perch up to 2 m above the ground. Decorations mainly comprise grey-green lichen, but may also include creamy-white flowers and fruit.*

[*Prionodura newtoniana*, Paluma, N Queensland, Australia.
Photo: Clifford & Dawn Frith]





*The **Great Bowerbird** uses snail shells and vertebrate bones among its bower decorations, sometimes bringing them from a considerable distance. One Great Bowerbird used the shells of mudflat-dwelling snails which were not found within 2 km of his bower. In a sample of bowers near Darwin, Australia, the number of decorative items at each bower varied from 6000 to more than 12,000, the majority being white or grey. The combined weight per bower ranged from 6 kg to over 12 kg, with the heaviest individual items weighing 40 g. Great Bowerbirds' avenue bowers are built 1–2 km apart on traditional sites, one of which is known to have been used for more than 70 years. The same structure may be used in consecutive years, or the bower may be rebuilt each season, either under the same bush or under another up to 100 m away. Bowers abandoned after years of use may sit around an active site. The bower is a thick-walled avenue of stout sticks, built upon a substantial platform, with some 700–920 sticks in a single wall. The tops of the inward-curving central inner walls sometimes meet to form a tunnel. Rarely, bowers may have a third or even a fourth wall. Bowerbirds will copy and learn from one another: after one Great Bowerbird began to introduce red objects among his decorations, others began to do so, and red objects are now part of the local Great Bowerbird culture. Other populations of this species actively avoid red objects. In rare instances, Great Bowerbirds have also had their bower structures influenced by males of another species.*

[Above: *Chlamydera nuchalis nuchalis*, Kakadu National Park, Northern Territory, Australia. Photo: Hanne & Jens Eriksen.

Below: *Chlamydera nuchalis orientalis*, Mareeba, Queensland, Australia. Photo: Clifford & Dawn Frith]







*The male **Fawn-breasted Bowerbird** builds a new bower every season, close to the previous one. The avenue is built on a deep platform of sticks, which extends out beyond each end of the avenue to form elevated apron platforms. One of these apron platforms is usually larger and better formed than the other. The base platform can be up to 170 cm long, 80 cm wide and 60 cm thick. The walls of the avenue are up to 36 cm long and 28 cm high externally, with the central avenue 9 cm wide. One hundred or more bower decorations may be placed in and at the end of the avenue, and hung from the walls. These can include green fruits, normally in small bunches, seed pods, unopened flower buds, and green leaves. This male (below, right) is "painting" the inner avenue wall of his bower, an activity typical of several, possibly all, avenue-building species. The "paint" may be charcoal or vegetable matter mixed with saliva; it dries to a dark powdery deposit. Males can invest considerable time in painting. Its function has not yet been satisfactorily explained, but it might be that freshly applied paint has the effect of assuring females that a bower is actively maintained, and the extent of it may provide females with an indication of the relative attendance of males at their bowers.*

[Above: *Chlamydera cerviniventris*, Portland Roads, N Queensland, Australia. Photo: Clifford & Dawn Frith.

Below: *Chlamydera cerviniventris*, Port Moresby, SE New Guinea. Photos: William S. Peckover]

were darker blue and reflected higher levels of ultraviolet light than less favoured ones; these features increase the visual contrast between decorations and the substrate on which they are placed and/or between the different kinds of decorations.

Not only do the males of some, if not all, of the avenue-building species build and decorate their bowers, but they also apply to the bower walls a "paint" of charcoal and vegetable matter mixed with saliva. In applying this paint, the Satin Bowerbird and some grey bowerbirds will use a piece of vegetable matter as a "brush" or tool; this, in fact, acts as a kind of sponge, wedge or stopper, rather than as a brush. The paint stains the inner avenue walls at about the beak height of the standing bird, and it dries to a dark powdery deposit. That bower-painting is an activity in which males of several avenue-builders invest considerable time raises the question of its function. Several suggestions have been made, but none of these is really a satisfactory one. It seems possible that freshly applied paint has the effect of assuring females that a bower is actively maintained, and the extent of it may provide females with an indication of the relative contemporary attendance levels of males at their bowers.

During the display season, adult males spend a great deal of time at their traditional court/bower site, vocalizing, maintaining the site, which involves building, painting and decorating, chasing away rivals, displaying, with or without another bird present, and courting and mating females. Courtship is instigated by the arrival of a female at the court or bower site, presumably having been attracted by the male's vocalizations. A female's arrival often results in the attending male initially moving away from her, as is so with the grey bowerbirds, or hiding from her view, as in the case of the Tooth-billed and Golden Bowerbirds and the gardener bowerbirds. Whereas male Tooth-billed and Golden Bowerbirds hide behind trees, male gardeners and avenue-builders use parts of their bowers as places behind or within which to hide. The Regent Bowerbird and, possibly, other species of silky bowerbird attract females by means of their colourful plumage and by calling in the canopy, and then lead them to the bower.

Females, while being courted, observe the male passively and silently. Catbirds typically, and other species occasionally, watch in this way from a perch; female Tooth-billed Bowerbirds observe from the court; those of Archbold's Bowerbird and the gardeners from the bower mat; those of the Golden Bowerbird from a bower perch; and females of avenue-builders watch from within the avenue. The males of most species commence courtship displays on the ground, but in the case of some gardener bowerbirds some simplistic "flight" displays between adjacent vertical saplings are sometimes performed first. Males typically court by demonstrating highly ritualized postures and movements accompanied by specific body, head and wing movements and particular calls. They may use decorations as display "props" held in the bill or, as is typical of avenue-builders, tossed towards the female. Latter components of male courtship can appear aggressive, often resulting in a female temporarily or permanently fleeing. Males sometimes perform "courtship" display in the absence of any conspecific, and this may be directed at the bower or its decorations. If a female is unimpressed or frightened by a male's advances, she leaves the bower site, sometimes pursued by the male. If suitably impressed by a male's courtship, she makes her readiness to mate known by solicitation posturing, which typically involves her in crouching, raising the hindquarters and tail, and vibrating the drooped wings. Mating normally takes place on the court or bower. Immediately following copulation, females vigorously flutter their partly opened drooped wings, but it is not known if this has a signal function or a physiological one. Males sometimes aggressively expel females from their court or bower immediately after mating.

Bowers and their accumulated decorations are truly symbolic of each individual male's efforts, and therefore of his relative genetic fitness and experience and, accordingly, his age or survival ability. A bower represents characters of a male bowerbird's sexuality that are external to his body. Upon the arrival of a female at these symbols of relative male attractiveness and fitness, the male dances complex steps in an attempt to attain its all-important goal, a successful mating. It is sexual selection, of male traits by females, that has brought about the amazing and uniquely complex courtship behaviour of male bowerbirds. A reasonable to good amount is known of the courtship of twelve of the 17 polygynous bowerbird species. In contrast, next to nothing is known of that of the Yellow-fronted, Masked and Western Bowerbirds, and nothing at all of courtship of the Adelbert Bowerbird. Limitations of space prohibit detailed descriptions of all of the displays that have been described. The following paragraphs, therefore, provide a broad summary, but, as the main



*The courtship of the **Western Bowerbird** is believed to be similar to that of its congeners. The Spotted Bowerbird* (Chlamydera maculata) *performs both central displays, in which the male stands among the decorations outside the bower with his crest raised, and displays in which he runs around the bower in wide circles. The Western Bowerbird's courtship is known to involve the Nape-presentation Display, in which the male presents his crest to the female. All three* Chlamydera *species with crests perform this display, but the two which lack crests also present their napes. It has been suggested that the latter species lost their crests while simultaneously developing more complex bowers.*

[*Chlamydera guttata*, Alice Springs, Northern Territory, Australia. Photo: Don Hadden]

features tend to be fundamentally similar within a genus, the courtship display of the best-known species of each is detailed.

Tooth-billed Bowerbird courtship commences with a male dropping on to his court and hiding behind his display-tree trunk to continue singing. If an approaching bird is a female, he changes his song to a subsong with vocal avian mimicry. When the female reaches the court, his vocal display suddenly becomes a vigorous visual display. He hops out from behind the tree to reveal a black mouth that strikingly contrasts with his white mandible linings, and he erects a conspicuous white "beard" of throat feathers. His initial side-hops are accompanied by a rapid swing of his closed tail upwards and sideways through an arc, in the same direction as that in which he hops. During the first side-hops the wings are closed or open, or sometimes both, but then the folded wings are rapidly lifted vertically above the side of the bird and the primaries rapidly flicked skywards. Each sideward hop consists of a double movement, or an immediately repeated hop, to the same side, the tail held pointing in that direction. Following side-hops, the male performs the first of a series of vigorous Leap/Wing-flaps, consisting of leaning progressively forwards with bill wide open, until lunge-leaping forwards at his point of imbalance. As he lunges forwards, his wings are fully opened and raised to 45 degrees or more above his back, and then beaten downwards as he leaps forwards and sideways, landing as his wings close. He then performs repeated Leap/Wing-flaps, interspersed by a sideward hop, in a zigzag progression towards the female. During the entire visual display, the male continues his subsong of vocal mimicry, punctuating it with a sharp, harsh, burring snort-like note and with "tuck-tic" notes during Leap/Wing-flaps. After this display to a point immediately in front of the female, he quickly flies to her, either directly or via one or several perches, and copulates. Copulation is aggressive, and during the process the male rapidly flaps his open wings while rocking from side to side and holding or billing the female's nape feathers.

Upon detecting a female near his bower, a male MacGregor's Bowerbird may initially simply raise his crest while rising up on stretched legs to sway his body from side to side, or he may perform an extra-bower display by leaping rapidly between vertical sapling trunks within 1–15 m of his bower. During these back-and-forth leaps, he flaps the wings once or twice and holds the crest erected and fanned. He then flutters or drops on to his bower mat to continue courtship. He hides from the female by moving behind the base of his central maypole, where he stands stiffly, with the beak and head pointing up and the breast pressed towards the mossy column base, with the crest in the normal position, and may begin a subsong of soft whirring or "zishshing" vocalizations, usually audible only from a few metres, that typically includes high-quality vocal mimicry of other birds. While emitting the subsong, he may give repeated simultaneous brief wing-flicks while laterally spreading the tip of his crest, each time accompanied by a sharp little hop; this sudden movement results in a split-second flash of crest colour. This point in the display is sometimes punctuated by a short, brief, forward and upward fluttering flight, rising to some 1–2 m, the male then immediately returning to his take-off point. If the female remains interested, she flies down to the mat, to the side of the maypole opposite that where the male is, and attempts to peer, lean or move to either side of the maypole in order to see him; he attempts to keep out of her sight by moving around the circular mat. This hide-and-seek vocal display continues until, suddenly and rapidly, the male changes his elusive behaviour to a visual display. He fully erects and fans his crest and simultaneously starts to sway extensively from side to side on extended legs, thus giving the female glimpses of his crest alternately on each side of the maypole. Suddenly, he rushes at the female from around the maypole in a rapid semicircular dance of mincing steps, his initial rush sometimes causing her to fly to adjacent foliage. If not, he rushes equally rapidly back and past his starting point, only to rush at her again from the other side of the maypole. This repeated movement is extremely rapid, and the female may initially try to maintain her distance from him by moving away in harmony with his rushes, attempting to keep the maypole between herself and him, or she may remain static throughout the visual display. If a female stands her ground in the face of these rushes, mating may occur.

The advertisement vocalizations of the male Archbold's Bowerbird, given from bower perches above his bower mat, become more frequent and intense and then, when a female is near, softer. By the time a female is on a bower perch, he drops on to his mat to commence courtship. First, he lowers his elongated and sleeked body to prostrate himself on lowered legs and press his underparts into the mat, his crest slightly fanned and his forecrown feathering erect and fanned. In this Prostrate posture,



Some grey bowerbirds make vigorous use of bower decorations during their displays. The peripheral displays of the ***Great Bowerbird*** *involve a strutting walk or run around the bower, during which the bird may pick decorative objects up and fling them down. The central displays, performed at the bower entrances, include an Upright posture, with feathers sleeked and bill open, Forward-stretch and Crest-presentation. The displaying male repeatedly darts rapidly forwards towards the silent female, which crouches motionless within the avenue, and then moves back again, often picking up decorations and aggressively shaking them from his bill.*

[*Chlamydera nuchalis nuchalis*,
Northern Territory, Australia.
Photo: Michael Gore/FLPA]





The avenue bower of ***Lauterbach's Bowerbird*** *is unique in having four walls. At each end of the main avenue, the platforms are elaborated into additional walls that create cross passages at right angles. The two inner walls are the shortest, and are lined with fine grass stems. Male Lauterbach's spend a lot of time "painting" the walls, and decorating the bower with grey and grey-blue river pebbles, large blue fruits, and medium-sized red fruits. When a female comes to the bower, she enters the main avenue and waits, generally without movement, except to turn her head from time to time, although she may pick at the sticks in the walls. The male approaches the entrance she is facing, remaining to one side, and leaning so that his head comes into her field of vision. He turns his head away in the Nape-presentation Display —although he lacks the crest of other members of his genus which perform this display. He often jerks his head sharply up and down. He may interrupt this display to present the female with decorations, such as red fruit, and he may also hold decorations in his bill while displaying. He accompanies his display with soft, "pathetic" calls. Presumably in response to the female's soliciting, he suddenly stops displaying, and runs round to enter the far end of the avenue, and mounts the female. During copulation (lower photo), he flaps his open wings. Courtship may take just a few minutes before copulation, or may last more than half an hour. The male may interrupt courtship to chase away other conspecifics, and the female may remain in the avenue while he does this.*

[*Chlamydera lauterbachi*, Baiyer River Valley, New Guinea. Photos: Clifford & Dawn Frith]





Recent work has revealed that the decorations most favoured by one population of male ***Satin Bowerbirds*** *were darker blue and reflected higher levels of ultraviolet light than less favoured ones. Two hundred or more decorations may be placed on the platform outside one or both avenue entrances. These can include natural objects (upper photo), such as feathers—mostly blue, notably flight-feathers of Crimson Rosellas* (Platycercus elegans) *—as well as flowers, fruits, snail shells, insect parts and pieces of sloughed snakeskin. Bowers closer to human settlements can include man-made items (lower photo), again with a preference for blue objects. In contrast to the decorations of* Chlamydera *bowers, these are not put in discrete piles, but may be sorted according to type. At the start of the display season, the adult male Satin Bowerbird builds a new bower on or adjacent to the spot used in the previous season. A bower can comprise more than 2000 sticks. The bower consists of two outward-curving, parallel walls of sticks, placed upright into a foundation platform of fine sticks and grass. The walls may form an arch, and the inner walls may be painted with ground charcoal, masticated foliage, liverwort, crumbly tree bark or fruits, mixed with saliva.*

[Above: *Ptilonorhynchus violaceus minor*, Atherton Tableland, Queensland, Australia. Photo: Clifford & Dawn Frith.

Below: *Ptilonorhynchus violaceus*, Australia. Photo: Roland Seitre]

he utters a continuous murmuring or bleating subsong while rapidly vibrating his lower mandible, partly exposing his pinkish-yellow mouth. This sound is frequently interspersed with hissing, chugging, spluttering, and notes like the sound of dripping water and lip-smacking, as well as mimicry of other bird calls and of the sound of whirring avian wings and fluttering vegetation. He also makes an occasional rapid and sharp shake of his head from side to side, causing his yellow crest to vibrate and become a blur, sometimes also pushing his bill into the mat as if "nuzzling" it. While prostrating himself, he occasionally raises his head and neck to perform a Shuffle side-hop of two or three movements to one side at the same time as he raises and swings his tail through an arc as he moves towards the female. If the female flies to the mat, the male's initial response is to rush at her in an aggressive way and to Displacement-chase her with loud calls to or just beyond the mat edge. He then prostrates himself again, and may repeat the process several times to entice the female back. With each eviction, the prostrate and softly calling male permits the nervous female to approach him more closely before his next Displacement Chase. When moving from one part of the mat to another, between prostrate displays, the male does so by light bouncing hops as he raises his tail to about 45 degrees and conspicuously swings it through an arc to one side during each hop, before flopping into the Prostrate posture. If a female persists in staying distant from the mat, the horizontally prostrate male appears to "vibrate-shuffle" over and through the thick mat of ferns, performing extremely rapid miniscule bouncing hops or leaps involving little upward movement as he "shuffles" forwards in a Grovel Display; all the time his legs are obscured by the sleeked body pressed into the mat. His head movements as he attempts to locate and follow her are conspicuously jerky, thus enhancing his yellow crest. Once the female is immediately beside the prostrate male, he performs a Head-lift and Shake display involving rapid vibrating of the head as the frontal-crest feathers are erected and projected forwards over the base of his upper mandible, and then repeated lifting of the head and bill from the bower mat. The male progressively increases the tempo of his Head-lift and Shake. At this point, the female will usually peck at his crest feathers once or twice. Suddenly, he utilizes the last of his increasingly rapid head-lifts as a means of raising his entire body and hopping on to the female to mate.

The courtship of the Golden Bowerbird involves five basic display phases: Chase, Bow, Head-nod-and-shake, Flight-hover, and Hiding. In the Bow, the male lowers his bill and head and erects the crown and nape feathering, emphasizing his yellow central crest, while his wings are drooped and occasionally flicked; he pulls his tail forwards beneath his lowered head and sometimes holds it aside. During the Head-nod-and-shake, he nods his downward-pointing head up and down, with head plumage erect, and shakes his head from side to side, thus accentuating his yellow crown and nape; as he nods, he sometimes pecks at his perch. In intense display, the male may perform the Bow and the Head-nod-and-shake consecutively, in either sequence, on the same perch, during which process he sometimes gives a rattle and one or more squeal calls. In the Flight-hover display, the male flies about his bower with slow and deliberate butterfly-like beats of the extensively opened wings, occasionally while holding a decoration in his bill, and from time to time he may rapidly and repeatedly fan his tail to the full extent in brief mid-flight hovers, thereby exposing the yellow outer rectrices. In addition, he will sometimes hover in front of a vertical sapling trunk or its leaves, the bill tip touching or almost touching the stem or leaves, while repeatedly fully fanning and closing his tail. He then flies, butterfly-like, to another sapling to perform the hover display again.

On seeing a female within his bower site, the male Golden Bowerbird does not approach her but, instead, gives some squeals, screeches and vocal mimicry and performs the Head-nod-and-shake and Bow, followed by one or more Flight-hover displays. He then moves up to about 20 m away from his bower to a perch, where he performs the Hiding display accompanied by a soft subsong incorporating high-quality avian vocal and other mim-



Despite the masses of blue decorations he has assembled, the courting male ***Satin Bowerbird*** *generally picks up and uses a relatively dull object, such as this grey-green leaf. With this held in his bill, he may jerk or shake his head aggressively, or drop the leaf and shake his head, as if in distaste. The courtship involves two display elements: the first is an active one, involving vocalized buzzing accompanied by body movements, with rapidly and vigorously repeated opening and closing of the wings, during which the male is mostly hidden by the bower wall; the second is static and involves continuous vocal mimicry, while the male raises and lowers himself on his legs. During either phase, he may raise and fan his tail. If the female solicits by crouching, he enters the avenue at the far end and mounts her.*

[*Ptilonorhynchus violaceus violaceus*, Lamington National Park, Queensland, Australia. Photo: Raoul Slater]



*The **Flame Bowerbird** builds a small, neat avenue with relatively few decorations, which may include blue, purple and brown fruits, bracket fungi, purple and white flowers, snail shells, and yellow-brown leaves within the avenue, and glossy blackish leaves outside it. One instance of courtship has so far been described. On catching sight of a visiting female, the male collected some sticks from nearby and began to dance, trying first to make himself appear as small as possible, and then to look bigger, enhancing the effect by spreading his wings. The dancing seemed to be the signal for the female to inspect the bower, at which point the male's dancing intensified. The birds touched bills while both were at the bower.*

[*Sericulus ardens*, Kiunga, New Guinea. Photo: Otto Plantema]

icry. He hides behind a tree trunk, branch or other suitable structure and peers intently around its edge while softly vocalizing; he often adopts a sleeked, rather serpentine posture, with the body held in a rigid shallow S-shape. Once a female settles on the bower perch, the male stops vocalizing, drops close to the ground, or sometimes on to it to make a brief serpentine run of several metres, and then makes an indirect, rapid, silent flight through the foliage to surprise and aggressively chase the female from his bower with loud calls. The male will repeat this procedure each time a visiting female returns to his bower, when displays other than Hiding can occur at any time and in any sequence. All five display phases are probably performed during successful courtship, perhaps in a typical sequence, but, since no descriptions of matings are available, this requires confirmation.

Most acts of courtship by male Regent Bowerbirds take place after a female arrives at a bower escorted by the bower-owner. Initial arboreal displays may be performed, but these are of low intensity and involve only limited posturing. Courtship at the bower involves three main display phases. During Initial Bower Display, the male stands upright at his bower entrance and emits a low, soft chattering and warbling song while watching the female perched a few metres away. Once she comes to his bower, he moves backwards some 20–50 cm and stands in front of the bower or on a nearby perch, facing her and singing. She comes to sit in the bower avenue or at an entrance to it and looks around her, sometimes pecking at the bower decorations. The male then begins the Central Bower Display, remaining within about 30 cm of a bower entrance, and facing her in upright stance; occasionally he picks up a decoration in his bill while making sideways movements of the head and neck. In this upright posture, he may gape while moving his head to one side. Then, in a slightly lowered posture, he "wing-flicks", by quickly opening and refolding a wing, and in this same slightly lowered posture he presents his nape to her and then lowers his bill; during this Nape-presentation posture his plush yellow nape feathers may be erected. Finally, the male moves his head back while making a series of bobbing movements. He also assumes a forward-bent posture while raising and repeatedly flapping both wings, with his bill open; during this posture, he lowers his head and slightly droops his wings as he runs forward. This Forehead-presentation Advance may be repeated, the male returning to his pre-advance location by running backwards. In the course of these central displays, his irides can suddenly become more conspicuously yellow as the pupils are contracted. The above-described postures can occur in various sequences. In the third and final main display phase, the Peripheral Bower Display, the male runs, hops and flies about, thus flashing his yellow wing markings, within 1 m of his bower; perching briefly, he may perform Wing presentations by repeatedly opening and closing a wing. During peripheral displays he will often be behind the female, which remains seated or crouched in the bower. Throughout the bower displays, and even with his bill closed or while holding a decoration, the male produces a continuous subsong that includes avian mimicry. If the female accepts the male, she crouches in his bower in a forward-tilted posture; he then enters the avenue from behind her and mates. Copulation occasionally occurs on the court directly in front of an avenue entrance.

Courtship by male Satin Bowerbirds involves two typical display phases. The first is a vocalized buzzing accompanied by body movements with repeatedly and rapidly opened wings, and the second a static phase accompanied by vocal mimicry. In a female's presence, the male's courtship follows a ritualized pattern. Giving soft pathetic or pleading-like squeaking and spluttering notes, the male, standing just outside a bower entrance, faces her but is entirely or mostly hidden from her by the end of a bower wall. He may adopt a rounded posture, with the folded wings held just above the back and with the tail down and stiffly vibrating vertically, occasionally opening his bill widely. He faces his bower and repeatedly pecks at or picks up a decoration, his head and bill jerked vertically up and down or shaken vigorously. His body is now held at about 45 degrees to the ground, bill down, tail up and body raised high to give an odd long-legged look as his soft pleading calls continue. Suddenly, his vocalizations change to a continuous mechanical, whirring buzz, while the tail feathers are slightly fanned and separated from one another in the vertical plane to form an inverted V-shape. He then raises his tail to more than 45 degrees and executes a series of twelve or more vigorous upward flicks of the wing farthest from his bower, the wing being usually closed but sometimes half-open; the first flick often involves both wings, and each wing-flick is punctuated by a louder whirring buzz call. The male then strides across and directly in front of his avenue entrance, and thus into full view of the fe-



On first encounter, bowerbirds typically chase off visitors of their own species, whether an adult male, a female-plumaged immature male, or a female. The extent of this "displacement chasing" varies between species. Golden Bowerbirds (Prionodura newtoniana) *aggressively pursue most female-plumaged visitors out of their bower sites. But male* ***Regent Bowerbirds*** *rarely chase visiting rival males, and may, as with the immature male here, display to them. During the various phases of courtship, the male erects and presents the plush yellow feathers on his nape and his forehead. While the female—or in this case, the immature male—crouches in the avenue or one of its entrances, he faces her (or him) in an upright stance, occasionally picking up a decoration, such as a leaf, in his bill, while making sideways movements of his head. Regent Bowerbirds, and possibly other species of silky bowerbird, attract females by means of their colourful plumage, as well as by calling in the canopy, and then lead them to the bower. In contrast to some plain-plumaged species which create elaborate, extensively decorated bowers, the bower of the Regent Bowerbird is simple and sparse. While other avenue bowerbirds reuse or refurbish their bowers, sometimes over several years, two-thirds of Regent Bowerbird bowers are maintained for fewer than eleven days. If intruding males do not destroy the bower, the owner may do so himself if he becomes aware that a rival has discovered it.*

[*Sericulus chrysocephalus*, Lamington National Park, Queensland, Australia. Photo: Clifford & Dawn Frith]





The bower of ***Archbold's Bowerbird*** *is described as a "dispersed maypole". It consists of a cleared area, on which an amorphous mat of fern fronds is gradually built. The mat may in time become more than two metres deep, and several square metres in extent, the largest known covering 29 m². Trailing stems of epiphytic orchids are draped from branches in saplings above the mat. The branches become thickly covered with orchid stems, but favoured perches are left bare, for the male to sing from, and for visiting females to watch the initial stages of his display from. Large mats may be accumulated over several years, the males renovating and adding to them at the beginning of each courtship season. One traditional bower site persisted for more than 15 years, and one adult male attended the same site for more than six seasons. Decorations typically include the occipital plumes, or "flags", of the male King of Saxony Bird-of-paradise* (Pteridophora alberti)*, which are given pride of place in the centre of the mat. These plumes often disappear from bowers between visits by observers, but theft of such decorations by rival males of this species has not been confirmed, although theft is generally common among bowerbirds. Other decorations include snail shells, beetle elytra (wing-cases), fruits, fungi, charcoal and tree resin. Decoration is also provided by the colour of the fern fronds, which are often collected while still green, but which dry to a darker brown, contrasting with the living plants of the surrounding forest. The orchid stems often remain alive for a while after being added, and some may be in flower.*

[*Archboldia papuensis sanfordi*,
Tari Gap, New Guinea.
Photos: Clifford & Dawn Frith]

male, while giving one to three vigorous flicks of a fully opened wing, or sometimes both wings, each accompanied by a louder buzz call. Before, between and after the wing-flicks, he holds his body in a ritualized rounded upright posture, or occasionally in a sleeked horizontal one, usually with a decoration held in the beak and the tail horizontal to the ground or lower. This striding phase takes him to the opposite position at the other bower wall, where he again faces the female and picks at or picks up a decoration while again wing-flicking. He then repeats his striding display across the bower entrance, thus returning to the position at which he started his courtship. Here, he once more faces the bower entrance and lowers his head and beak to pick at or hold a decoration, while holding his tail high above the back, with the rectrices slightly fanned and parted to form a "V"; he may give double wing-flicks, this time flicking the wings out sideways. Simultaneously, he gives a rattle call followed by a continuous vocal display of avian mimicry mixed with odd ticking or tapping notes, and he repeatedly lifts his head and beak, with a decoration in the bill tip. At this point, the male adopts a sleeked bow posture with the tail raised and/or a posture with the plumage ruffled, the back arched and the wings and tail drooped, and he may also turn his lowered beak away to present his nape to the female while holding a decoration, or he may hide behind a bower wall. In this stationary, mimicry-producing phase, the male repeatedly slightly raises and lowers himself on his legs. He will often interrupt these static postures by strutting back and forth, in circular movements, across his court. If the female solicits, by crouching and vibrating her lowered wings and raising her rump, the male strides quickly past the avenue entrance, down the length of his bower, to enter by the far entrance and mate the female from behind, often while still holding a decoration in his beak. One female was observed to be mated at the same bower by the same adult male over two consecutive seasons, while other females may choose either the same male or a different one each year.

Courtship by Spotted Bowerbirds is central and peripheral in nature, depending on where in relation to the bower it is performed. In central displays a male stands among bower decorations on his court immediately adjacent to the bower, and in peripheral displays he postures while running widely around his bower. Peripheral displays more often follow central ones, and in both of them males more or less expand the lilac crest. Four conspicuous central display postures are the Upright, the Raised-wings, the Sideways Crest-presentation and the Forward Crest-presentation, these appearing in any sequence and accompanied by various hissing, crackling and ticking vocalizations. Display movements are erratically jerky and violent, a male frequently leaping upwards to his own height and backwards, to alight some 15 cm farther from his bower. The displaying male repeatedly darts rapidly forwards towards the silent female crouching motionless within his avenue, and then moves back again, often picking up decorations and aggressively shaking them from his beak. Males sometimes perform a Nape-presentation Display, outlined in detail in the following paragraph. In peripheral display, the male Spotted Bowerbird raises the head, stiffens the neck, and opens the beak. The tail is cocked and the wings drooped loosely from the body, much in the manner of a Great Bowerbird displaying in similar circumstances; in doing so, males do not hop but, rather, they strut, walk or run animatedly, the crest fully erect, while hissing and while circling the bower and the female within. During this movement around the bower, the male raises and lowers his head while simultaneously moving his body with jerky and undulating actions, reminiscent of swimming, as his closed wings are drooped and then raised and the tail lowered. The male's crest is erected in the shape of a fan, like that of displaying Western Bowerbirds, but not in the circular shape of the Great Bowerbird. During peripheral display, the male Spotted Bowerbird sometimes holds bower decorations in the beak and also repeatedly picks up and violently throws down these objects. Occasionally, the displaying individual leaps upwards and/or backwards, sometimes simultaneously flicking his wings, to resume the swimming-like running motion. When moving away from the bower, males are less vocal than when moving towards it and they adopt two distinctive postures: the Rooster Pose, in which the head and tail are held high, the wings horizontally away from the body, and the legs moved in a prancing gait; and the Penguin Pose, in which the body is erect, with the neck extended and the head high, the tail down, and the wings tight against the body, while moving with small rapid steps with the legs kept close together. Copulation takes place in or immediately adjacent to the bower avenue. Courtship can last for a few minutes to more than an hour.

Males of all five *Chlamydera* grey bowerbird species, including the Spotted Bowerbird, perform a Nape-presentation Display to females as a latter-stage courtship posture; so, occasionally, do Satin Bowerbirds, and Regent Bowerbirds do so typically but in a more animated way. In the display, the male's nape crest, in the three *Chlamydera* species that have one, is presented to the female while the bill, a potentially threatening feature, is turned away from her. Tellingly, courting adult males of the two crestless species also present the nape to the female in just this way. The



*When the advertisement vocalizations of a male **Archbold's Bowerbird** have brought a female to a bower perch, he drops to the bower mat. In the Prostrate posture, he presses his stretched body into the mat, with his forecrown feathers elongated and his crest partially fanned. He occasionally shakes his head, making his yellow crown feathers vibrate. If the female stays on the perch, he shuffles towards her with tiny hops, his body still prostrate, in the Grovel Display. When the female lands on the mat, he evicts her in a series of aggressive displacement chases, letting her come closer each time she returns.*

[*Archboldia papuensis sanfordi*, Tari Gap, New Guinea. Photo: Clifford & Dawn Frith]

crestless species, therefore, employ a posture evolved specifically to present a colourful crest, a feature that they no longer possess, but in their evolutionary past presumably did. This fits with the insightful "transferral effect" hypothesis of bowerbird student E. T. Gilliard, which implies that males of these species have lost the crest as they simultaneously evolved more complex bowers. This trend is recognized also within the *Amblyornis* species: adult male MacGregor's and Yellow-fronted Bowerbirds sport a large colourful crest and build relatively simple bowers compared with the larger and more complex ones of the much smaller-crested male Streaked Bowerbird and the completely uncrested male Vogelkop Bowerbird. Thus, courts and bowers, or some aspects of them, represent elaborate male display traits. Presumably, this arose as a result of both sexual selection by females for meaningful, externalized symbols of male fitness, namely the bower and its decorations, and natural selection acting to reduce conspicuously bright plumage, which could attract predators and thus make colourful males susceptible to predation.

Female bowerbirds are initially attracted to a bower site and then to the bower therein. It is assumed that they assess the relative level of a male's attendance at his bower site and the quality and quantity of his vocalizations, plumage, bower structure and decorations, displays, and more, before soliciting the individual by which they select to be mated. Female Satin Bowerbirds choose a mate through a complex process, during which they make sequential decisions based on male traits, and females reveal age-specific differences in those male traits assessed by them. One study showed that each female Satin Bowerbird's home range included the bowers of about 5–7 males and that several, up to an average of about three, are sampled by each female; initially, numerous bowers were visited then subsequently fewer, the females returning for mating to the individual male found to be the most attractive.

Because the only contribution that the male will make to successful offspring production is his sperm, the females have to be extremely discerning in their choice of mate. Given the male's limited contribution to the lengthy and costly investment in progeny that the female must make, the female must seek to maximize the quality of genes passed to her offspring by their father. This will, at least, enhance the possibility of her sons being relatively successful in the all-important mating game.

Most active bowerbird nests are located within hearing distance of a male calling at his court or bower. The fact that, in any given area, relatively few, typically older males of polygynous species perform the majority of matings in any breeding season raises the possibility that experienced females could seek to nest near the traditional bower site of a specific male. Females of many polygynous bird species mature and breed at a younger age than males of the respective species, but the age at which female bowerbirds start to breed remains unconfirmed; sparse facts suggest that they may reproduce in their second or third year, as female Satin Bowerbirds do reach sexual maturity at that age. The operational sex ratio of Regent Bowerbirds was estimated to be two adult females to each adult male, which clearly indicates a strong female bias. While this ratio is based on the assumption that only male Regent Bowerbirds in full adult plumage are sexually active, some males in immature to subadult plumage may have fully developed gonads and could be reproductively active.

Bowerbirds, both monogamous and polygynous, often habitually use the same location, and sometimes the very same site, in which to build the nest each year. The traditional use of a location season after season often results in an accumulation of old nests. The time of year when nest-building commences and the length of the nesting season vary with habitat, altitude and weather (see General Habits). In summary, the peak in courtship and nesting activity of most ptilonorhynchids in Australia is during late September to December; for the grey bowerbirds, the peak period typically precedes the monsoonal rains, nesting taking place mainly during October to December or January, although this is subject to annual variation. Mating takes place before or after nest-building and up to a month prior to egg-laying.

Nests are built mostly in forks of trees, saplings, bushes or vine tangles, except for that of the Golden Bowerbird, which, uniquely within the family, is built into a tree crevice. The majority of nest-sites are visually cryptic and often are situated away from convenient arboreal pathways for predators, being isolated from surrounding vegetation. The task of nest-building is undertaken by the female alone.

Catbird nests are large, deep, open bowl-shaped structures consisting of four basic layers. These are, first, a stick foundation, and then a deep nest cup, a layer of decaying wood and/or mud pieces on top of the central leafy bowl, and an inner egg-



*At the beginning of the display season, the male **Tooth-billed Bowerbird** begins to place leaves on an oval or circular site of 1–8 m². The site includes one or more trees for displaying. As the season progresses, he clears the litter from the site, and adds more leaves, with the pale undersides uppermost. The bowers of most bowerbird species are evenly dispersed, but those of Tooth-billed Bowerbirds tend to be clumped together, in what may be exploded leks. Studies suggest that male Tooth-billed Bowerbirds holding traditional sites at the heart of an aggregation of courts are older and more dominant individuals, with higher mating success than their peripheral rivals.*

[*Scenopoeetes dentirostris*, Atherton Tableland, Queensland, Australia. Photo: Peter Marsack/ Lochman Transparencies]





At the commencement of courtship, the male ***Tooth-billed Bowerbird*** *drops from his song-perch onto his court, and hides behind his display-tree trunk, where he continues singing. If the approaching bird is a female, he changes to a quiet subsong involving mimicry of other birds. Golden Bowerbirds* (Prionodura newtoniana) *also hide behind trees when a female arrives, whereas male gardeners and avenue-builders hide behind or within their bowers. When the female Tooth-billed Bowerbird reaches the court, the male's vocal display suddenly becomes a vigorous visual display. He hops out sideways from behind the tree, and gapes to reveal a black mouth that contrasts with his white mandible linings, while simultaneously erecting a conspicuous white "beard" of throat feathers to either side of his gaping mouth. He continues his sideways hops, swinging his tail, and raising and flicking his folded wings. Then he begins a series of Leap/Wing-flaps, lunging forwards, with his wings first fully opened and raised to 45° or more above his back, and then beaten downwards as he leaps forwards and sideways, landing as his wings close. If he is displaying on a perch, the Wing-flap is given without the Leap, which is replaced with vigorous up-and-down flexing of the legs. Throughout the visual display, he continues his subsong, with "tuck-tic" notes during Leap/Wing-flaps. When his display has brought him immediately in front of the female, he flies to her, either directly or via a series of perches. Copulation is aggressive, with the male holding or billing the female's nape while rocking from side-to-side and rapidly flapping his wings. The entire courtship, from the vocal to the visual displays, generally takes under 80 seconds, with the visual display occupying just over a quarter of that time.*

[*Scenopoeetes dentirostris*, Atherton Tableland, Queensland, Australia. Photos: Clifford & Dawn Frith]



*Male **Satin Bowerbirds** take seven years to acquire their full adult plumage. This prolonged period in female-like plumage limits the aggression from adult males, allowing the young birds to visit and learn bower-building and display skills from them. Adult males are tolerant of these visits early and late in the season, but are more aggressive while females are visiting. Immature and subadult Satin Bowerbirds also spend time at communally constructed bowers where they practice bower building and displaying. They also visit occupied bowers in the absence of their owners. As they grow older, they narrow their attention to a few sites, eventually settling on one where they will challenge the incumbent.*

[*Ptilonorhynchus violaceus violaceus*, Brisbane Forest Park, SE Queensland, Australia. Photo: Brian J. Coates]

cup lining. Among bowerbirds, the wood-and-mud component is unique to the catbirds, but its function is unconfirmed. Nests of the *Amblyornis* gardener bowerbirds and of Archbold's and Golden Bowerbirds are substantial, deep, bowl-shaped three-layered structures, having a foundation, a nest cup and a lining. In contrast, those of Tooth-billed, Regent and Satin Bowerbirds and of the *Chlamydera* grey bowerbirds are relatively small, frail, shallow and slightly concave, consisting of only two layers, a loosely built outer saucer-shaped sticky foundation with an egg-cup lining.

Clutches laid by the Ptilonorhynchidae comprise one to three eggs. As both catbird sexes provision their offspring, they might be expected to have larger clutches than those of polygynous bowerbirds, the females of which raise the offspring alone. A marked difference, however, is not apparent. Both the catbirds and the polygynous species have an average clutch size of one egg in New Guinea and almost two in Australia. Bowerbird eggs are typically elliptical ovate, or long oval, in shape.

Eggs of the catbirds, the Tooth-billed, Archbold's and Golden Bowerbirds and the gardener bowerbirds, all of which nest in



*The males of many bowerbird species steal decorations from one another. The abundance of decorations at a bower thus provides females with an indicator of the relative fitness of an individual male, based on his success in conflict with his rivals. The loss of even a few decorations may make the difference between mating failure and success. Theft —and destruction of bowers—tends to take place when the victim is away, as has happened to this **Satin Bowerbird**. The victim may retaliate by stealing his decorations back; but if the raider damages the bower, the victim must first spend time rebuilding, so the raider maximizes the time he can keep the stolen goods.*

[*Ptilonorhynchus violaceus* and *Sericulus chrysocephalus*, Australia. Photo: Roland Seitre]

denser rainforest, are pale and unmarked. Those species of more sparsely foliaged forest and woodland to arid open habitat, namely the Satin Bowerbird, the *Sericulus* silky bowerbirds and the *Chlamydera* grey bowerbirds, lay eggs that are colour-pigmented and vermiculated, streaked or blotched. The white eggs of the Golden Bowerbird are unique within the family, and their lack of colour may be an adaptation to this species' crevice-nesting habit.

Both monogamous and polygynous bowerbirds typically lay the eggs of a clutch on alternate days. Incubation usually, but not always, begins once the clutch is complete, normally commencing, therefore, after the laying of the second egg or, with three-egg clutches, the third egg. The incubation periods of bowerbirds in the wild are known for six species. Those of the monogamous catbirds, at 22–24 days, are similar to those of the polygynous species, at 21–23 days, with the exception of Archbold's Bowerbird, this polygynous species having an incubation period of 26–27 days. With both the monogamous and the polygynous species only the female incubates, and in both groups she devotes about 70% of the diurnal time to the task. The hatching of clutches of more than one egg is nearly synchronous, siblings emerging within 24 hours of each other. Male catbirds provision the mate during the nest-building and egg-laying periods, and, while figs are the principal food that male Green Catbirds feed to the mate, protein-rich insects and insect larvae become more prominent during the egg-laying period.

Information on the nestling periods of ptilonorhynchids in the wild is available for eight species. Again, the periods are broadly similar for the two groups, 20–21 days for the monogamous species and 17–21 days for the polygynous ones. Once more, Archbold's Bowerbird provides an exception, with a period of 30 days. The latter's longer nestling period is presumably an adaptation to the cold and wet high-altitude habitat which it occupies, and where food suitable for nestlings may be scarcer.

The amount of time that a female parent spends in brooding is influenced by brood size. Black-eared Catbirds and Golden Bowerbirds spend more time in keeping single nestlings warm than they do with larger broods, presumably because smaller broods are less demanding in other respects and/or because siblings stay warmer for longer than lone nestlings. The point at which bowerbirds cease brooding their nestlings varies from species to species. Although available information is limited, there appears to be little difference between nestling periods of the catbirds and the Golden Bowerbird, which provision their young predominantly with fruit, and those of the Satin, Spotted and Great Bowerbirds, which feed a greater proportion of animal items to the nestlings.

The rates at which parent Black-eared and Green Catbirds feed the nestlings are similar, at an average of five meals per hour. The average nestling-feeding rates by females of polygynous bowerbirds vary according to species, from three to almost seven meals per hour (see also Food and Feeding). Parent bowerbirds swallow the nestlings' faeces throughout most of the nestling pe-



*In northern Queensland, where the **Great Bowerbird** and the **Spotted Bowerbird** co-occur, hybridization sometimes occurs. Here, a male Great Bowerbird is displaying to a Great/Spotted hybrid (at the far end of the avenue), while a male Spotted Bowerbird looks on. Bower structure has been suggested as a species-isolating mechanism, but some sympatric avenue-building species are known to have influenced each other's structures. Spotted Bowerbird avenues are wider than those of Great Bowerbirds. This may be because courting Spotted Bowerbird males are particularly aggressive, and females may select wider avenues that give room to retreat.*

[*Chlamydera nuchalis orientalis* and *C. maculata*, near Charters Towers, Queensland, Australia. Photo: Clifford & Dawn Frith]



*Females of polygynous species like the **Satin Bowerbird** undertake the tasks of nest-building, incubation, and brooding and provisioning of the offspring entirely alone, unaided by the male. However, most active nests are within hearing distance of a male calling at his bower. Like bowers, nests occupy traditional sites, and are built on or near those of previous years. Each sex may have been influenced by the proximity of the other in their selection of these sites. Satin Bowerbirds build relatively small, frail, shallow nests, consisting of only two layers, an outer structure of twigs with an "egg-cup" lining of leaves.*

[*Ptilonorhynchus violaceus minor*, Paluma, N Queensland, Australia. Photo: Clifford & Dawn Frith]





When provisioning their young, parent bowerbirds carry food items along the length of the bill and in the mouth. Unlike the birds-of-paradise, they do not regurgitate them. Both fruits and animals are fed to nestlings of all ages. In the case of predominantly frugivorous parents, like ***MacGregor's Bowerbird****, the proportion of insects which they feed to their nestlings is greatest in the period just after hatching, and declines thereafter. Bowerbirds lay one to three eggs, although the average clutch size is one egg in New Guinea and almost two in Australia. There is no significant difference between the clutch sizes of the monogamous catbirds, in which both parents help to provision the young, and polygynous species in which the female raises the young alone. MacGregor's Bowerbird lays just one egg. Bowerbird eggs are typically elliptical ovate, or long oval, in shape. The eggs of MacGregor's Bowerbird are plain creamy white, while those of other species that nest in dense rainforest are also pale and unmarked. Those species of more sparsely foliaged forest or arid open habitats, including* Sericulus *silky bowerbirds and* Chlamydera *grey bowerbirds, lay eggs that are coloured and patterned.*

[*Amblyornis macgregoriae kombok*,
Tari Gap, New Guinea.
Photos: Clifford & Dawn Frith]



Females of polygynous bowerbird species tend to feed their young with a single animal type, such as cicadas, grasshoppers or skinks, as the dominant component of the diet. Grasshoppers and locusts are important to the grey bowerbirds of dry and open habitats. Of 359 identified meals that one ***Spotted Bowerbird*** *female brought to her brood, 146 were fruit, and 213 animal, of which 122 were grasshoppers or crickets. Twenty-four of the largest grasshoppers were stripped of their legs, wings and heads. Average nestling-feeding rates by females of polygynous bowerbirds vary according to species, from three to almost seven meals per hour.*

[*Chlamydera maculata*, near Charters Towers, Queensland, Australia. Photo: Clifford & Dawn Frith]

riod. Only when the nestling development is well advanced do the parents carry away faecal sacs and/or seeds, voided into the nest by the young.

Hatchlings characteristically have pink-orange to yellowish-orange skin, a varyingly yellow to orange gape, a white egg tooth, and conspicuous long fluffy down. The bill and leg colours are variable. Nestlings have dense long down in patches on the crown, wings and body, this down being reddish grey-brown on catbirds, greyish-brown on the Tooth-billed Bowerbird and gardener bowerbirds, dark greyish-brown on Archbold's and Golden Bowerbirds, and a much paler grey on Satin and Regent Bowerbirds and the grey bowerbirds. The eyes start to open when the nestling is some 7–9 days old, and are fully open by 9–12 days of age. The flight-feathers of young Black-eared Catbirds and Golden Bowerbirds start to appear at 5–6 days, and those of Archbold's Bowerbirds at 8 days; the primaries burst from their pin sheaths on days 13–14 in the case of the Black-eared Catbird and 11–12 days in the Golden Bowerbird, but not until 14–15 days in Archbold's Bowerbird. On leaving the nest, the youngsters have a tail less than 10% of the average length of that of their parents. They leave the nest when well feathered, in a plumage broadly similar to that of their parents. What little is known about juveniles suggests that there is a period of dependency upon their parent or parents of at least 40–60 days.

Bowerbirds typically nest once in each season, but they can renest following the seasonally early loss of a clutch or brood. Given that nest-building usually takes 1–3 weeks, that incubation and nestling periods each last about three weeks, and that it takes at least 2–3 months to raise a fledgling to independence, few females could have time to raise a second brood in a single season. The proportions of successful nests, eggs and nestlings are far greater for the monogamous catbirds than they are for the polygynous Golden, Regent and Satin Bowerbirds. Catbird pairs produce more fledged offspring than polygynous bowerbirds, their number of fledglings per nesting attempt being twice that of Golden Bowerbirds and three times that of Satin Bowerbirds. It is not surprising to find higher productivity for the large, powerful, and monogamously pair-bonding catbirds compared with the polygynous species, the females of which, unlike those of the catbirds, nest alone, with no assistance from the males. Archbold's Bowerbird has a notably high nesting success rate, which may be due in part to such variables as longer incubation and nestling periods, combined with a high-altitude habitat supporting fewer predators.

While there are many reptile, bird and mammal species that would potentially take the contents of bowerbirds' nests and the attending adults, there are few records of their doing so. Indeed, the cause of egg or nestling loss among the Ptilonorhynchidae usually remains unknown. Catbirds are themselves predators of the nest contents of other birds, including bowerbirds. These and other considerations aside, those bowerbirds whose nesting has been studied are able to maintain a respectably high level of success in terms of the number of offspring produced from eggs laid in climatically typical years. When disturbed by a potential predator, a parent often performs a distraction display; produces vocal mimicry, typically of the calls of predators; adopts a frozen posture; and/or attacks or chases the intruder.

Bowerbirds have a remarkably high survivorship and life expectancy. Individual catbirds are known to have lived for at least 19 years, and males of polygynous bowerbirds for up to 27 years. Adult males demonstrate long-term fidelity, in some cases of up to two decades, to a bower site and even to a specific bower structure.

Movements

All members of this family are essentially resident. Home ranges of Australian catbirds average 1–2 ha, but their all-purpose territory during breeding becomes smaller as the parents focus their foraging closer to the nest-site. Limited evidence suggests that Black-eared Catbirds in some upland areas may move to lower altitudes during the winter months.

Polygynous bowerbird species are non-territorial, except for the defence of the immediate area of the bower or nest-site. Females and immature males maintain relatively large, overlapping home ranges throughout the year, foraging in the same areas as do adult males. Foraging distances vary both from year to



*The nestling period of **Archbold's Bowerbird** is much longer than that of other bowerbird species, at 30 rather than 17–21 days. This is presumably an adaptation to the cold and wet high-altitude habitat that Archbold's occupies, where food suitable for chicks may be scarcer. Of meals brought to the nest by one female, 71% were fruit and 29% animal; of the animal meals, 30% were tree-climbing skinks or parts of them. A lizard's tail is being delivered to the nestling here. The amount of time a female spends in brooding is influenced by brood size, some species spending longer with just a single chick. Despite the longer nestling period, Archbold's stops brooding at around 15 days, which is little different to species whose young leave the nest up to ten days earlier.*

[*Archboldia papuensis sanfordi*, Tari Gap, New Guinea. Photo: Clifford & Dawn Frith]

year and between different times of the year, depending upon relative food availability, which in turn affects home-range size. Greater distances are traversed by males flying to creeks in order to bathe or drink, and shorter ones when stealing a decoration from a neighbouring rival's court or bower, or when chasing a rival from their own site.

Young males in female-like plumage move extensively about their habitat for several years. Subsequently, however, they do so over an increasingly limited area, to visit only several adjacent traditional bower sites before concentrating on one, for ownership of which they may then challenge the occupying adult male. Before or after commencing nest-building each season, female bowerbirds move freely about their habitat from bower to bower, in order to assess the quantity and quality of their structures and decorations, before selecting a mate (see Breeding).

In the winter period, aside from local movements within home ranges, when certain food resources are relatively scarce, some bowerbirds, and perhaps most typically woodland-dwelling Satin Bowerbirds, move to more open habitats and form flocks containing as many as 100–200 individuals. These flocks, generally typical of Satin Bowerbirds but also, to a lesser degree, of Regent Bowerbirds, graze upon shoots and leaves of grasses, herbs, shrubs and trees, including those of eucalypts, and eat cultivated green vegetables and soft fruits. Larger flocks can consist of both adult males and female-plumaged individuals, up to 40 adult males having been observed in one flock, whereas smaller flocks may be mostly single-sex gatherings. Grey bowerbirds also flock in winter, normally in much smaller groups.

Localized movement down to lower altitudes may be made by at least some Tooth-billed, MacGregor's, Golden, Regent and Satin Bowerbirds during the winter months, when food resources are relatively scarce, but little is known about the ages or sexes of the individuals involved.

Relationship with Man

Indigenous peoples of Australia and New Guinea would in all probability have been fascinated, possibly for in excess of 50,000 years, by the building and acquisitive behaviour of male bowerbirds. Some bowerbird skins, or parts thereof, such as crests or capes of the adult males, have been traded within and beyond New Guinea for thousands of years. This would have involved skins of, especially, Masked and Flame Bowerbirds, but also, to a limited extent, of crested adult male gardener bowerbirds. Local people have long adorned themselves with crests of dried skins, of gardener bowerbirds in New Guinea, and of grey bowerbirds in Australia.

Historically, aboriginal Australian and Papuan people have always held male bowerbirds and their works in high regard, respecting these birds for their abilities and industry. Some Australian aboriginal people also respect and fear the male birds as avian custodians of ceremonies involving secret "business", or rites, of their own. It is also believed that some bowerbirds, including at least the Spotted, Western and Great Bowerbirds, may steal bones of humans for their own ceremonial purposes, and so they and their bowers are traditionally left unmolested. Papuan men greatly admire male bowerbirds for their vigour and artistry in accumulating and displaying what they perceive to be the birds' equivalent of wealth, corresponding to the valued items that Papuan men accumulate in order to pay the relatives of intended wives. As a result, there are several stories and myths about MacGregor's Bowerbirds and their bowers, as there doubtless are about other bowerbirds among the peoples of New Guinea and Australia.

The influence of the bower-decorating activities of Great and, to a lesser extent, Spotted Bowerbirds on the Australian landscape recently attracted the attention of a team consisting of one biologist and several archaeologists. They observed that the items accumulated by the birds may include moderately large collections of aboriginal and other human artefacts. While these will reflect certain weight, size and colour restrictions and/or preferences of the bowerbirds themselves, a significant number of artefacts, given that more than 1000 stone pieces have been found on a single bower, may be gathered at more traditional bower sites. It is quite conceivable that the birds may use these over consecutive seasons for decades. Because of the birds' colour preference, it was noted that in dark soil or rock areas, where



Fruit, particularly figs, makes up around 80% of the diet of ***Black-eared Catbird*** *nestlings. The remaining 20% is animal food, over half of this being insects such as beetles, but over 20% may be the heads, legs, intestines and other parts of nestlings or small adult birds, and birds' eggs. Although information is limited, there appears to be little difference between nestling periods of the catbirds (19–20 days), and bowerbird species which feed their chicks a greater proportion of animal items. Male catbirds do not participate in nest-building, incubation of the eggs, or brooding of the nestlings, but they do assist by provisioning the mate and offspring with meals. Brood size averages one in New Guinea, and two in Australia; Black-eared Catbirds spend more time keeping single-chick broods warm, presumably because they spend less time bringing food to the nest for smaller broods, and siblings stay warmer for longer than lone nestlings. The parents spend almost half their time at the nest, sometimes just peering at the nestlings. When disturbed by potential predators they will perform a distraction display, stumbling across the forest floor with fluttering wings. Catbird nests are bulky, deep, bowl-shaped structures consisting of four basic layers: a foundation of large sticks; a deep cup of green and dried leaves; a layer of rotten wood fragments and mud; and an egg-cup lining of small twigs and vine tendrils. Among the bowerbirds, the inclusion of mud and decaying wood is unique to the catbirds, and its function is unknown.*

[*Ailuroedus melanotis maculosus*, Paluma, N Queensland, Australia. Photo: Clifford & Dawn Frith]



The flight-feathers of young ***Golden Bowerbirds*** *start to appear at 5–6 days, and the primaries burst from their pin sheaths at 11–12 days. By 16 days, all feathers are out of pin except those on the throat and head, which remain downy. Over the 17–20 days of their nestling period, the young increase from around 10 g on their first day of life to 55 g, or 75% of mean adult weight, on the eve of departure. Bowerbirds typically nest once in each breeding season, but may try again after the loss of a clutch or brood early in the season. Given that nest-building usually takes 1–3 weeks, that incubation and nestling periods each last about three weeks, and that it takes at least 2–3 months to raise a fledgling to independence, few females could have time to raise a second brood in a single season. Golden Bowerbirds and other polygynous species have far lower nest, egg and nestling success rates than the monogamous catbirds. The overall success rate of Golden Bowerbird nests is probably less than 25%, whereas for Black-eared Catbirds* (Ailuroedus melanotis) *it is upwards of 51%. Catbirds are themselves predators of eggs and nestlings, including those of the Golden and other bowerbirds. For Satin Bowerbirds* (Ptilonorhynchus violaceus)*, egg success is estimated at 15%, and this species may not breed at all in seasons when the populations of cicadas are low. Archbold's Bowerbird* (Archboldia papuensis)*, an exception in this as in several other aspects, has a notably high nesting success rate, with 88% of eggs producing fledglings. This may be due in part to the longer incubation and nestling periods, combined with a high-altitude habitat supporting fewer predators. While many reptile, bird and mammal species are potential nest predators, there are few records, and the cause of egg or nestling loss among the Ptilonorhynchidae usually remains unknown.*

[*Prionodura newtoniana*, Paluma, N Queensland, Australia.
Photo: Clifford & Dawn Frith]

aboriginal artefacts are produced from white or grey stone, the accumulation of them by bowerbirds could be considerable.

Bowerbirds have for long been sought for exhibit in public aviaries, such as within state and national zoological gardens, because the bower behaviour of the males adds significant entertainment and interest value not provided by other birds. The skilful bower-building behaviour of male bowerbirds and the acquisitive manner in which they gather, steal, defend and artistically display bower decorations, and even paint their structures, in order to impress females are character traits to which people can closely relate, as they echo a human-like scenario. The sounds that bowerbirds mimic also make these birds highly endearing to people. It is perhaps the mimicry by Spotted and Great Bowerbirds with which most people would be familiar, because these species associate closely with some town and city suburbs and with homes on outback stations: imitations of the sound of dogs barking, cats meowing, cattle moving through vegetation, mammals walking over ground litter, Emus (*Dromaius novaehollandiae*) crashing through wire fencing, wood-chopping, a stockwhip being used, and even the sound of conversing people have been reported. Some New Guinea bowerbirds are also excellent mimics, including human voices in their repertoire. It is depressing that the males of some ptilonorhynchid species are increasingly likely to be heard mimicking also the sound of chainsaws and of trees falling.

Bowerbirds are perceived by both ornithologists and laypersons as epitomizing the Australian avifauna as much as Emus and kookaburras (*Dacelo*). Indeed, some members of the family feature commonly in the public and commercial sectors of modern life. This widespread fascination continues unabated, with good numbers of books, films, magazine and newspaper articles, postage stamps, and commercial companies and their products featuring facts about and images of these extraordinary birds.

Status and Conservation

Of the Australian bowerbirds none is currently rare or endangered, although habitat destruction and degradation have resulted in range loss for some species, especially the Green Catbird and the Regent, Golden and Spotted Bowerbirds. The last of these is now considered extinct in South Australia and possibly also in Victoria, although it was always limited geographically and in abundance in both states. A recent action plan for avian conservation in Australia excludes the bowerbirds from consideration, other than including them within over a thousand taxa of "Least Concern", and treating the subspecies *carteri* of the Western Bowerbird as a near-threatened taxon because of its highly restricted range and estimated total number of 2000 breeding birds.

Bowerbirds with restricted ranges in New Guinea leave no room for complacency. These include the Yellow-fronted Bowerbird, restricted to the Foja, or Gauttier, Mountains, in the northern part of west-central New Guinea, and the Adelbert Bowerbird, confined to the Adelbert Mountains, in the north-eastern sector of the island. The latter species was until very recently considered globally threatened, the only bowerbird so listed; it was classified as Vulnerable. However, the revised listings for 2009 have reappraised the status of this species with the result that it is now downlisted to Near-threatened. The only other bowerbird currently thought to be potentially close to globally threatened status is Archbold's Bowerbird, which is likewise treated as Near-threatened, within its patchy distribution in the central mountain range of New Guinea.

The Adelbert Bowerbird is generally rather uncommon within its small range, but recent field studies revealed that it can be quite numerous locally. It occupies a relatively narrow elevational zone, mainly at 1200–1450 m. Although the Adelbert mountain range does not have a heavy human population, the altitudinal band in which this bowerbird is found is the same as that within which local agriculture is practised, while villagers rely heavily on hunting for food; fortunately, the people of Salemben village do not hunt this species. Much of the species' range is comparatively inaccessible, and so not immediately vulnerable to logging. In addition, there are extensive areas of mature secondary forest, which seem to be acceptable to this bowerbird. With increasing human population, further deforestation will doubtless occur, although there is hope that this may only be on a small scale. Very few data are available, however, on the current levels and trends of hunting and of forest destruction.

Archbold's Bowerbird, again a poorly known species, is found at a few places in high-lying forests of New Guinea, from the Weyland Mountains eastwards to the Eastern Highlands. Although fairly common locally, it appears generally to be rare. It is believed to have a rather small global population, and this may be declining as a result of habitat loss. The two subspecies of



Young bowerbirds leave the nest when well feathered, in a plumage broadly similar to that of their parents, though tail length is less than 10% of the average for adults. One captive ***Regent Bowerbird*** *fledgling which left the nest at 19 days still had a downy head at 37 days, when it performed flights of up to one metre; at 42 days, contour feathers covered most of its head, its rectrices had reached 8–10 cm, and it was able to fly up to 10 m. The prolonged period of parental care—young birds continue to beg and be fed for two to three months—helps improve juvenile survival. Bowerbirds have a remarkably high survivorship, and life expectancy.*

[*Sericulus chrysocephalus*, Lamington National Park, Queensland, Australia. Photo: Jiri Lochman/ Lochman Transparencies]





No bowerbird species is currently considered to be globally threatened, but the situation of species with restricted ranges in New Guinea, with its human population growing at 3% per year, leaves no room for complacency. These species are generally poorly known, with little or no baseline information from which to assess population trends. The ***Adelbert Bowerbird****, once thought to be in decline because of habitat loss, is now believed to be stable, and so in 2009, the species was downlisted from Vulnerable to Near-threatened on the IUCN Red List. Endemic to the Adelbert Mountains in central-north Papua New Guinea, and occupying a narrow altitudinal band at 1200–1450 m, this species has a range estimated at some 570 km², within which it is suspected to occur at only a handful of locations. The global population is estimated to be fewer than 10,000 individuals, but the Adelbert Bowerbird is relatively numerous within its favoured habitat, which does not appear to be under significant immediate threat, particularly as much of its range remains inaccessible. However, further information on the rate and extent of habitat clearance is needed to confirm its status. Little is known about its mating and breeding biology. The male builds a small avenue of unbranched twigs, like those of other* Sericulus *silky bowerbirds It is typically decorated with a few brown or yellow leaves, and blue fruit of various sizes; most of the decorations are sited within the avenue. The courtship of the male has not been described, although one tame male raised but did not spread the filamentous, silky flame-scarlet feathers of its cape.*

[Above: *Sericulus bakeri*, Keki Lodge, Adelbert Mountains, New Guinea. Photo: Steve Young.

Below: *Sericulus bakeri*, Adelbert Mountains, New Guinea. Photo: Ron Hoff]



Despite the fact that its trend appears to be downwards, the decline in the population of the ***Green Catbird*** *is not as rapid as to approach the threshold for threatened status. Its range, though restricted, still covers over 200,000 km² within the Eastern Australia Endemic Bird Area, and includes many protected areas, particularly the seven separate rainforest areas which together constitute the 2035 km² East Coast Temperate and Subtropical Rainforest Parks World Heritage Site. The species is absent from rainforest fragments under 2·5 ha. The Green Catbird was once considered good eating, and birds are still sometimes killed when they feed on cultivated fruit.*

[*Ailuroedus crassirostris*, Lamington National Park, Queensland, Australia. Photo: Graeme Chapman]

Archbold's Bowerbird have sometimes been treated as separate species (see Systematics). The eastern one, *sanfordi*, appears to have a total range of only about 800 km², and on two mountains within this tiny range it is threatened by logging activities. The western populations, constituting the nominate race, appear to be larger in number and are considered probably secure, at least in the short term.

Fortunately, most bowerbird populations presently appear to be stable. As is the case for most bird species, it is loss and degradation of habitat and predation by exotic animals, particularly feral cats, that potentially threaten some bowerbirds today. Hunting has rarely represented a significant threat, although shooting did play a role in the localized decline of Spotted Bowerbirds. Some Australian bowerbirds are certainly killed by feral cats at water troughs and bores, and at their bowers. The recent spread of feral cats and other exotic predatory vertebrates in New Guinea could represent a real future threat to bowerbirds, especially the more geographically restricted species, in what is the main part of the family's range. It is unlikely that any bowerbird species is presently threatened with extinction, or under threat of significantly serious population decline, unless global warming proves detrimental to upland species. The status of bowerbirds does, however, require far greater vigilance in New Guinea than in Australia.

Several live captive bowerbirds, including all three catbird species and the Fawn-breasted and Flame Bowerbirds, have recently appeared in collections in Europe, North America and the Middle East. Some, if not most, of these individuals were presumably exported illegally, most likely out of West Papua via South-east Asia, but this limited trade is thought at present not to represent a threat to any of the members of the Ptilonorhynchidae. Conserving bowerbirds today should be a matter primarily of ensuring that no significant further loss of habitats occurs.



The two races of ***Archbold's Bowerbird*** *appear widely separated geographically. The eastern race,* sanfordi, *has a total range of around 800 km², with habitat on two mountains threatened by logging. Fire damage has resulted in the abandonment of at least six traditional bower sites below Tari Gap. The nominate race in the west of New Guinea appears to have a larger population, and is considered secure. But the huge Central Papuan Mountains EBA, to which Archbold's Bowerbird is restricted, has been relatively little studied ornithologically. Archbold's may be one of a number of species with apparently disjunct distributions which prove to have more contiguous, larger, populations.*

[*Archboldia papuensis sanfordi*, Tari Gap, New Guinea. Photo: Clifford & Dawn Frith]

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PLATE 19

inches 4
cm 10

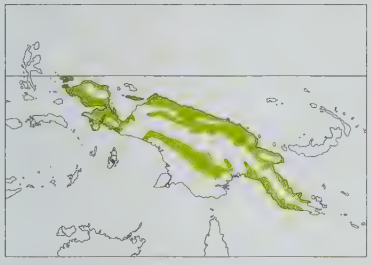
Genus *AILUROEDUS* Cabanis, 1851

1. White-eared Catbird

Ailuroedus buccoides

French: Jardinier à joues blanches **Spanish**: Maullador Cariblanco
German: Weißohr-Laubenvogel
Other common names: White-throated/Barbet-like/Least Catbird

Taxonomy. *Kitta buccoides* Temminck, 1836, Lobo, Triton Bay, New Guinea. Birds from Waigeo included in nominate race, but sometimes separated as *oorti*. Four subspecies recognized.
Subspecies and Distribution.
A. b. buccoides (Temminck, 1836) – W Papuan Is (Waigeo, Batanta, Salawati), and NW New Guinea E to Siriwo R in N and, in S, to Triton Bay.
A. b. geislerorum A. B. Meyer, 1891 – Yapen I (in Geelvink Bay) and N New Guinea from Mamberamo R area E to Collingwood Bay area.
A. b. cinnamomeus Mees, 1964 – S New Guinea from Mimika R E to upper Fly R and L Kutubu area.
A. b. stonii Sharpe, 1876 – SE New Guinea from upper Purari R (including Karimui, Bomai and Soliabeda areas, in Eastern Highlands) E along coast to Amazon Bay.



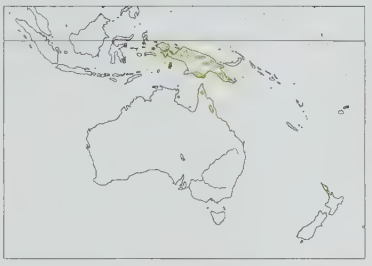
Descriptive notes. 24·5 cm; male 110–172 g, female 100–152 g. Nominate race has variable mid-brown to olive-brown crown tinged greenish, ear-coverts, side of lower head and throat mostly whitish with some black spotting; upper neck buff, large black feather tips forming broad spotted collar; upperparts, including upperwing-coverts and uppertail, rich parrot-green, flight-feathers brownish-olive with broad paler cream trailing edges, distinctive pale terminal spot on outer web of each secondary; underparts pale cinnamon, sharply contrasting large black spots (particularly on breast); undertail dark brown with green-blue wash (darker than underwing); iris deep blood-red; bill whitish, washed grey-blue; legs blue-grey. Differs from *A. melanotis* in smaller size, unmarked dark brown to tan crown, distinctive white ear-patch, and conspicuous ventral black spotting. Sexes alike in plumage, female on average smaller than male; one captive female was noted to have pure brown iris. Juvenile is like adult, but crown duller, less black, underparts more dilute buff with more greenish wash, iris greyer and bill dusky to blackish; immature like adult, but bill darker. Race *geislerorum* has distinctively paler tan crown than nominate, and white ear-covert feathering extending forwards to include lower lores, underparts variable but tend to be whiter with bolder black spots; *cinnamomeus* is similar to nominate, but brown crown tinged more green, lower lores more white, heavier black spotting on white ear-coverts, cinnamon underparts darker; *stonii* differs from others in having distinctive blackish-brown crown and lores contrasting with pure white ear-coverts, and deep cinnamon underparts with smaller black spots. Voice. Territorial calls by pairs include cat-like nasal meowing, prolonged harsh churring, and low hissing or rasping; partners maintain contact with brief high-pitched metallic sharp "tink" or "chink" notes.
Habitat. Forest, occasionally forest edge; mainly lowland and hill forest, but also monsoon forests in SE. Sea-level to 800, sometimes to 1200 m.
Food and Feeding. Fruits and insects; also small adult birds, and doubtless nestlings. Nestling diet fruits and arthropods. Forages among foliage, mostly of forest substage, also to middle levels. Singly, in pairs and in family parties; sometimes in groups with other fruit-eating birds.
Breeding. Season variable across range, egg-laying recorded in Jan, Apr–Jun and Nov, nestlings in May–Jun; breeding bimodal at some localities. Forms perennial socially monogamous pairs within all-purpose territory. Courtship involves silent vigorous chases through low foliage and on ground, and hopping on to and between sapling trunks and branches. Nest a sturdy bowl of stout twigs with few large leaves, shallow egg-cup depression lined with strong slender stems (unlike nests of congeners, lacks wood pulp and mud), built c. 2–3 m above ground among bases of pandanus tree (*Pandanus*) fronds or in upper fork of slender leafy sapling; in captivity, nest built by female alone. Clutch 1 egg in wild, 1–3 eggs in captivity; in captivity, incubation period 17–24 days and nestling period 17–23 days; only female incubates and broods, but both sexes feed young; one wild juvenile remained with parents for more than 3·5 months after leaving nest.
Movements. Resident.
Status and Conservation. Not globally threatened. Common and widespread throughout most of range; uncommon in Ok Tedi mining area, in C New Guinea. Nine birds/10 ha of lowland rainforest at Brown R, in SE of range.
Bibliography. Banks (1998), Beehler *et al.* (1986), Bell (1982d), Coates (1990), Diamond (1972), Frith & Frith (2001b, 2004), Gilliard (1969), Gilliard & LeCroy (1967a, 1968), Gregory (1996), Hoyle (1975), Marshall (1954), Mayr (1931c), Rand (1942a, 1942b), Richter & Schumann (2008), Ripley (1964), Schodde & Hitchcock (1968), Simson (1907), Wilkinson (2001), Urbach (2008).

2. Black-eared Catbird

Ailuroedus melanotis

French: Jardinier oreillard **German**: Schwarzohr-Laubenvogel **Spanish**: Maullador Orejudo
Other common names: Black-cheeked/Spotted Catbird

Taxonomy. *Ptilonorhynchus melanotis* G. R. Gray, 1858, Aru Islands.
Probably forms a superspecies with *A. crassirostris*; sometimes considered conspecific, but treatment as separate species supported by morphological and geographical factors, and equivocal protein-allozyme data. Birds of this species in Fakfak Mts, Kumawa Mts and Wandammen Mts (all NW New Guinea) of uncertain racial identity and tentatively included in *arfakianus*, but confirmation required; limits of race *jobiensis* uncertain, and birds in Adelbert Mts could belong to *astigmaticus*; birds in Jimi R area, also of uncertain race, tentatively included in *guttaticollis*. Ten subspecies recognized.
Subspecies and Distribution.
A. m. misoliensis Mayr & Meyer de Schauensee, 1939 – West Papuan Is (Misool).
A. m. arfakianus A. B. Meyer, 1874 – mountains of Vogelkop (Tamrau and Arfak), Onin Peninsula (Fakfak Mts), Bomberai Peninsula (Kumawa Mts) and Wandammen Mts, in NW New Guinea.
A. m. jobiensis Rothschild, 1895 – Bewani Mts, Torricelli Mts, Prince Alexander Mts, middle Idenburg R and Adelbert Mts, in N New Guinea.
A. m. facialis Mayr, 1936 – Nassau Mts and Oranje Mts, in W New Guinea.
A. m. guttaticollis Stresemann, 1922 – Hunstein Range, Sepik R and Jimi R, in NE New Guinea.
A. m. astigmaticus Mayr, 1931 – mountains of Huon Peninsula, in NE New Guinea.
A. m. melanotis (G. R. Gray, 1858) – Aru Is, and lowland Trans-Fly region of S New Guinea.
A. m. melanocephalus E. P. Ramsay, 1883 – mountains of SE New Guinea E from Herzog Mts in N and Mt Karimui (and possibly Kratke Mts) in S.
A. m. joanae Mathews, 1941 – E Cape York Peninsula (Pascoe R and Iron Range areas S to Rocky R, in McIlwraith Range), in N Queensland (NE Australia).
A. m. maculosus E. P. Ramsay, 1875 – wet tropics of N Queensland from Big Tableland S to Seaview Range and Mt Halifax.



Descriptive notes. 29 cm; male 196–285 g and female 196–261g (New Guinea), male 145–205 g and female 140–199 g (Australia). Nominate race has black crown to nape spotted with white to buff (pale feather centres), spots larger and sparser on crown, smaller and denser on nape, and variably washed greenish; remaining facial areas of contrasting black and finely marked white feathering, but conspicuous solid black ear-patch; chin blackish, throat dirty whitish to pale buff, strongly marked by indistinct dark greyish feather tipping; upperparts grass-green to emerald green, upperwing rich parrot-green, white spots on some flight-feather tips; uppertail emerald-green, central feather pair with tiny white tips (or no white), remaining rectrices extensively tipped white; upper breast dirty buff with green wash, heavily scalloped with blackish-brown broad feather edging, remaining underparts buffy with variable greenish wash and variable amounts of dark margins; some undertail-coverts with one or two indistinct broad pale greyish chevron-shaped bars; iris deep blood-red; bill pale grey to creamy white; legs blue-grey. Sexes alike in plumage, female on average smaller than male. Newly fledged juvenile (of race *maculosus*) has downy crown dark chestnut-brown, back and wings like adult, ventral plumage uniformly pale greyish-white with green wash, iris mid bluish-grey (darker, blackish-grey, against pupil), bill pale dirty whitish; immature like adult, but crown and nape (or only nape) marked with finer, narrower, light central feather shafts and buff crown spots, pale throat spots and central feather marking of entire underparts whiter, broad feather edging on underparts more pure green. Races differ mainly in size, plumage coloration and extent of markings, New Guinea birds larger and heavier than Australian ones: *arfakianus* differs from nominate in having extensively much darker (black) spotted throat, dark green chest, paler (white or almost so) large spots on black crown, and larger and clear white patch behind black ear-coverts; *misoliensis* is like previous, but blacker at base of throat; *jobiensis* has spotting on blackish crown more buff (less pure white), obvious white patch behind black ear-coverts, more blackish chin, throat and upper chest but fine buff spotting thereon, and remaining underparts darker; *facialis* is like nominate, but spots on crown and mantle darker, more cinnamon, and throat more buff (less white); *guttaticollis* has spotting of crown to mantle more rufous and less buffy, throat and chin much darker, underparts generally more rufous; *astigmaticus* is longest-tailed race, has blacker crown with fewer, paler and finer spots; *melanocephalus* has blacker-looking crown (buff spots slightly smaller and/or sparser), is blacker on chest and throat, more rufous below; *joanae* is most similar to nominate, but with markings on chest less black; *maculosus* has head, nape and upper back less deep black than nominate, with dark brownish feather edges, pale spots small, underparts paler and greener with broad brown-green feather edges, chest less heavily marked. Voice. Cat-like nasal meowing, wailing territorial song given by pair-members throughout year; also sneeze-like sounds and harsh scold notes; partners maintain contact by sharp high-pitched single or double "tick" or "tic" notes.
Habitat. Lowland and upland tropical rainforest and adjacent tall secondary growth and wet sclerophyll forest, also gardens and orchards; in New Guinea, also mixed (particularly riverine) rainforest to open eucalypt–paperbark (*Eucalyptus–Melaleuca*) forest in S (Merauke R area) and monsoon woodland and scrub in S Trans-Fly. Sea-level to 2250 m (mainly 600–1700 m) in New Guinea; to 1540 m (mainly below 900 m) in Australia.
Food and Feeding. Mostly fruits, predominantly drupes and berries, also some flowers, stems, sap, and animals (mostly arthropods); in Australia (race *maculosus*), also bird eggs and nestlings. Nestling diet mostly fruits, especially figs (*Ficus*), also animals; earthworms (Oligochaeta), insects and pieces of birds recorded for *maculosus* nestlings. Caches fruits in niches for later consumption. Forages mostly by searching, occasionally sallying, in canopy, mainly for fruits; also among understorey and on forest floor for leaf-litter invertebrates, especially when feeding young. Feeds alone, in pairs and in family parties; associated with other fruit-eating birds (including other bowerbird species) in tree canopy.
Breeding. Season Aug–Jan in New Guinea, but little known; Aug–Mar (peak Oct–Dec) in Australia, duration of season c. 4 months. Long-standing monogamous pair within all-purpose territory; pair typically persists for several years within home range, mean size of which 1·6 ha, flies average c. 70 m from nest to forage, little overlap in foraging ranges of adjacent nesting pairs (race *maculosus*). Courtship involves little more than hopping excitedly about perches by both partners, male sometimes giving sharp calls, often while holding in bill food, which he may pass to female after mating. Nest a large, bulky, deep, open bowl with sparse to substantial foundation of larger sticks, deep cup mainly of large green to dried leaves, inner layer of decaying wood pulp and/or mud pieces, and egg-cup lining of fine twiglets and supple vine tendrils; built c. 1–7 m above ground, mostly in sapling or climbing vines; nest-site often reused habitually. Clutch 1–2 eggs (mostly 1) in New Guinea and 1–3 eggs (mostly 2) in Australia, eggs laid on alternate days; incubation by female, period 22–23 days; nestlings brooded by female for up to 15 days, fed by both sexes, nestling period 19–20 days; parents perform display over forest floor to distract predators; one adult-sized juvenile with parents c. 50 m from nest, 49 days after having left it. Overall nest success rate 57% (for 63 nests of race *maculosus*), and average of one fledged young produced per pair per season; will renest following seasonally early loss of clutch or brood. Oldest recorded individual more than 19 years of age.
Movements. Resident. Longest distance travelled by marked individual 2 km. Possible winter dispersal to lower altitudes in Australia.

On following pages: 3. Green Catbird (*Ailuroedus crassirostris*); 4. Tooth-billed Bowerbird (*Scenopoeetes dentirostris*); 5. MacGregor's Bowerbird (*Amblyornis macgregoriae*); 6. Streaked Bowerbird (*Amblyornis subalaris*); 7. Vogelkop Bowerbird (*Amblyornis inornata*); 8. Yellow-fronted Bowerbird (*Amblyornis flavifrons*); 9. Archbold's Bowerbird (*Archboldia papuensis*); 10. Golden Bowerbird (*Prionodura newtoniana*).

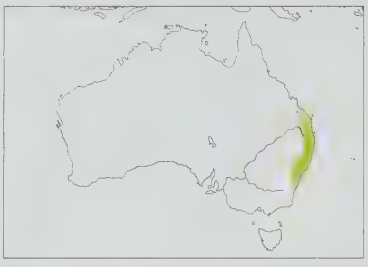
Status and Conservation. Not globally threatened. Common and widespread throughout range. Distribution in New Guinea possibly more extensive; once heard throughout mid-montane forests of Ok Tedi area, in C New Guinea, although unrecorded there during four subsequent years.
Bibliography. Bell (1969a), Christidis & Schodde (1992), Coates (1990), Diamond (1972), Ford (1977), Frith, C.B. (1994c), Frith, C.B. & Frith (1990d, 2001b, 2001c, 2001d, 2004), Frith, D.W. & Frith (2000), Gilliard (1969), Gilliard & LeCroy (1967a), Gregory (1996), Higgins *et al.* (2006a), Hoogerwerf (1964), Hunt (1992), MacGillivray (1918), Mack & Wright (1996), Marshall (1954), Mees (1982), Miller (1937), Pratt & Stiles (1983, 1985), Rand (1942a, 1942b), Rowland (2008), Schodde & Mason (1999), Warham (1962).

3. Green Catbird

Ailuroedus crassirostris

French: Jardinier vert **German**: Grünlaubenvogel **Spanish**: Maullador Verde
Other common names: Large-billed Catbird

Taxonomy. *Lanius crassirostris* Paykull, 1815, "Nova Hollandia" = Sydney, New South Wales, Australia.
Probably forms a superspecies with *A. melanotis*; sometimes considered conspecific, but treatment as separate species supported by morphological and geographical factors, and equivocal protein-allozyme data. Monotypic.
Distribution. Coastal E Australia from SE Queensland (Dawes Range area) S to SE New South Wales (to area due E of about Canberra).



Descriptive notes. 31 cm; male 167–289 g, female 169–211 g. Plumage above is mostly green, blackish feather tipping giving variably smudged finely spotted appearance to crown, ear-coverts, malar area and chin, and fine line of white feathers, finely flecked blackish, encircling eye; nape, mantle and side of neck finely and sparsely streaked whitish, streaks becoming broader and forming conspicuous white patch on lower neck (above carpal joint of closed wing), outer webs of primary coverts, tertials and secondaries broadly tipped whitish (conspicuous spotted appearance); chin and throat dirty whitish with blackish feather bases and greenish tips (heavily mottled appearance); breast paler, more yellowish-green, than upperparts, becoming more dilute on lower parts to straw-yellow central abdomen; feathers of lower throat finely streaked to spotted white centrally, marks becoming increasingly broad and elongate on breast (spotted appearance) and below (streaked appearance); undertail-coverts with very dilute green wash, and basal ones with narrow greenish subterminal and terminal bar; iris deep blood-red; bill pearly whitish, variably washed greenish; legs variably pale. Sexes alike, female on average smaller than male. Newly fledged juvenile has russet down on crown, upperparts like adult but duller, underparts much less green and darker, dirty whitish with very faint green wash on central belly and abdomen; immature has finer, narrower, pale nape markings, reddish-brown iris, greyer bill. Voice. Territorial song of pair variable cat-like wailings; also sneeze-like sounds; partners maintain contact with sharp high-pitched "tick" or "tic".
Habitat. Subtropical rainforest and associated edges, eucalypt (*Eucalyptus*) forest and woodland, gardens and orchards; favours watercourses, especially for nesting. Sea-level to c. 1000 m.
Food and Feeding. Mostly fruits, especially figs (*Ficus*), some flowers, leaves, succulent stems; animals, mostly arthropods, but also tree-frogs and nestling birds. Nestling diet mostly fruits, especially figs; some animal items, including beetles (Coleoptera), cicadas (Cicadidae), millipedes (Diplopoda), pieces of birds. Caches fruits for later consumption. Forages mostly by searching, occasionally making sallies, predominantly in canopy for fruits, but occasionally on ground for invertebrates. Robs smaller passerines of their prey. Feeds alone, in pairs and with other fruit-eating birds, including other bowerbird species.
Breeding. Breeds mid-Sept to Feb/Mar, peak Oct–Dec, duration of season c. 4 months. Monogamous pair within all-purpose territory; nesting territory 0·6 ha, parents ranging average of c. 38 m from nest, at other times foraging mostly confined to 1·2-ha home range. Courtship involves intense chasing by partners in and about tree canopies; male feeds mate throughout year. Nest a large, bulky, open cup consisting of foundation of sticks and twigs, discrete deep, compact and substantial bowl of large dried leaves and few vine stems, inner layer of decaying wood and sometimes earthy epiphytic fern matter, with finer twiglet and vine tendril egg-cup lining; built c. 2–18 m above ground in fork of densely foliaged small to large tree, in vine tangle or atop epiphytic ferns; nest-site often reused habitually. Clutch 1–3 eggs, mostly 2, laid on alternate days; incubation by female, fed on nest by male, period 23–24 days; nestlings brooded by female, brooding declines after day 13 but continues at low intensity until fledging, young fed by both sexes, nestling period c. 21 days; parents display on forest floor to distract predators; one juvenile remained partially dependent on parents for more than 72 days, two others independent c. 80 days after fledging. Overall nest success 65% (25 nests), each pair averaging 1·1 fledged young per season; pairs renests following loss of clutch or brood, particularly if early in season. Oldest marked individuals lived for at least 13 years.
Movements. Resident. Longest distance travelled by marked individual 9 km.
Status and Conservation. Not globally threatened. Restricted-range species: present in Eastern Australia EBA. Fairly common and widespread throughout range where extensive habitat remains; rare or absent in isolated rainforest patches less than 2·5 ha in extent.
Bibliography. Baker *et al.* (1999), Blakers *et al.* (1984), Chaffer (1931b), Church (1997), Donaghey (1981, 1996), Frith (1980), Frith & Frith (1979, 2001b, 2004), Gannon (1936), Gwynne (1937), Higgins *et al.* (2006a), Howe (1986), Innis & McEvoy (1992), Jackson (1921), Lea & Gray (1936), Lenz (1999), Male & Roberts (2002), Marshall (1930, 1935, 1954), McGill & Lane (1955), Rowland (2008), Schodde & Mason (1999), Woodall (1994, 1997).

Genus *SCENOPOEETES* Coues, 1891

4. Tooth-billed Bowerbird

Scenopoeetes dentirostris

French: Jardinier à bec denté **German**: Zahnlaubenvogel **Spanish**: Pergolero Dentado
Other common names: (The) Stagemaker, Stagemaker Bowerbird, Toothbill/Tooth-billed Catbird

Taxonomy. *Scenopoeus dentirostris* E. P. Ramsay, 1876, Bellenden Ker Range, 3000–4000 feet [c. 915–1220 m], north Queensland, Australia.
Sometimes placed in genus *Ailuroedus*. Birds from Johnstone R described as a geographical race, *minor*, but differences from those in rest of range considered trivial. Treated as monotypic.
Distribution. Wet tropics of NE Queensland (from Big Tableland S to Mt Elliot), in NE Australia.



Descriptive notes. 27 cm; male 132–199 g, female 157–182 g. Drably plumaged cryptic brownish bowerbird with bill adapted for leaf-eating (folivory); specialized notches and cusps (or "teeth") on cutting edges of lower mandible fitting into reciprocal indentations in closed upper mandible. Male has head and entire upperparts brown-olive, with fine eyering of rust-coloured feathers; ear-coverts finely streaked dilute cinnamon (paler feather centres); leading edges of flight-feathers and wing-coverts paler, more cinnamon-brown, bases and proximal inner webs of primaries horn-coloured, remainder of primaries and entire secondaries pale brownish-olive; throat dirty buff, variably smudged and streaked with pale cinnamon-grey horn, underparts dirty whitish, heavily streaked brownish-olive, undertail-coverts barred fuscous; iris dark deep brown, almost blackish; bill blackish, paler mandible tips and cutting edges, mouth interior blackish to black; legs variably mid-grey. Sexes alike, female may be on average slightly heavier than male, and mouth yellowish to pinkish-flesh. Newly fledged juvenile is slightly downy grey on head, has breast and throat buff with grey markings, mantle dark olive-grey, upperwing-coverts olive-brown, edged rufous, primaries grey, outer webs edged brown, iris grey, bill grey with darker tip, mouth pale orange, legs light grey; immature male mouth colour as for adult female, rectrices more pointed terminally, and conspicuously paler ochreous leading edges of flight-feathers and upperwing-coverts; male takes at least 4 years to gain black mouth, subadult male mouth partly blackish to black. Voice. Male gives loud advertisement vocalizations (single squeal, screech and "chuck" notes, continuous babble and mimicry) from perches above display court; excellent mimic, at least 40 other bird species, fruit-bats (Pteropodidae), frogs, crickets (Orthoptera) and cicadas (Cicadidae) imitated. Quieter courtship subsong given together with vocal mimicry of avian and other sounds. Silent in austral winter.
Habitat. Upland rainforests, typically at 600–900 m, occasionally higher, to 1600 m; in winter months also lower, 350 m and sometimes to sea-level. Traditional court sites mostly on hilltops and contiguous slopes or ridges, less densely on steep slopes, flatter areas dissected by creeks, typically in undisturbed rainforest but also in adjacent disturbed rainforest and in acacia (*Acacia*) regrowth forest.
Food and Feeding. During display season eats mainly fruits, with some flowers, stems, leaves and animals (mostly arthropods); in winter months mostly leaves and succulent stems. Nestling diet fruits and insects, particularly beetles (Coleoptera). Forages by searching in canopy for fruits; also sallies and hawks termites (Isoptera) and cicadas. Uses mandibles to manipulate leaf pieces skilfully into compact wads, before mandibulating, or "chewing", them and then ingesting food. Feeds alone or with other fruit-eating birds, including other bowerbird species.
Breeding. Season Sept–Jan, peak of egg-laying Nov–Dec; display season starts Aug–Sept (earlier if fruits abundant), peak Oct–Dec (when male attendance on average more than 60% of daylight hours), wet-season rain (Jan–Mar) ends court attendance, but some brief post-moult activity Feb–Apr. Polygynous, promiscuous male seasonally clears and decorates terrestrial court; female builds and attends nest alone. Traditional court sites clumped and may form exploded lek, average inter-court distance 50–68 m, fidelity to single court site by individual adult male 20 years or more; court up to c. 2 × 4 m, encompassing base of at least one display tree trunk and decorated with up to c. 180 fresh leaves (placed paler underside uppermost), recleared each season; leaf theft by rival males common; average home range of four adjacent court-attending males 9·5 ha (mean overlap between them 50%), males travelled average of c. 60 m from court to forage and to steal or harvest leaves, and up to c. 400 m to creeks to drink or bathe. Courtship by male involves hiding behind display trunk and giving subsong of mimicry (Vocal display), followed by vigorously animated posturing and vocalization (Visual display) as male rushes across court to female; if she holds her ground in face of this advance, male mates upon reaching her. Nest sparse with stick (sometimes orchid stem) foundation, egg-cup lining of finer twigs, built c. 8–27 m above ground in densely foliaged vine tangle; two active nests were c. 50 m from active traditional court sites. Clutch 1–2 eggs, mostly 2; no information on incubation and nestling periods; female performs display to distract predators; a juvenile still being fed by parent in Apr. One male lived for at least 19 years and another for 20 years after capture, former discernibly immature in appearance for at least 4 years and adult for 15 more, latter was adult when marked and thus lived to more than 24 years old; average annual survival rate and life expectancy over 19 consecutive seasons for 24 males in Paluma Range 90% and 9·4 years, respectively.
Movements. Presumed mainly resident; during winter months some individuals, possibly immatures, descend to as low as sea-level.
Status and Conservation. Not globally threatened. Restricted-range species: present in Queensland Wet Tropics EBA. Common throughout small range; surviving habitat fully protected. In Paluma Range, traditional court sites relatively densely clumped in optimal habitats, where c. 2 courts/ha and inter-court distance 60 m, but more dispersed on less favoured topography, where less than 1 court/ha and courts more than 100 m apart. Selective logging results in reduction, by one third, of numbers of courts attended by males.
Bibliography. Barker & Vestjens (1990), Crome & Moore (1989), Frith & Frith (1979, 1985a, 1993e, 1994b, 1995a, 1999a, 2001b, 2001d, 2004), Frith & McGuire (1996), Frith, Frith & Moore (1994), Grant & Laurance (1991), Higgins *et al.* (2006a), Jackson (1909, 1910), Lavery & Grimes (1974), Marshall (1951b, 1954), Moore (1991), North (1909), Phillips (2002), Rowland (2008), Schodde & Mason (1999), Vinson & Freeman (2006), Warham (1962).

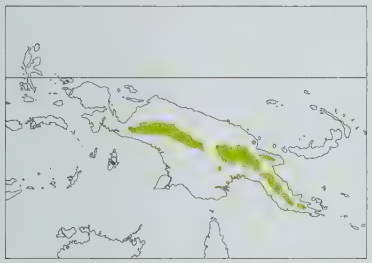
Genus *AMBLYORNIS* Elliot, 1872

5. MacGregor's Bowerbird

Amblyornis macgregoriae

French: Jardinier de MacGregor **Spanish**: Pergolero de MacGregor
German: Goldhaubengärtner
Other common names: Crested/Gardener/Mocha-breasted Bowerbird, Crested/MacGregor's Gardenerbird; Huon Bowerbird (*germana*)

Taxonomy. *Amblyornis macgregoriae* De Vis, 1890, Musgrave Range, 7000–9000 ft [c. 2130–2740 m], south-east New Guinea.
Has hybridized with *A. subalaris*. Race *germana*, bowers of at least some of which differ from those typical of species, possibly represents a separate species. Seven subspecies recognized.
Subspecies and Distribution.
A. m. mayri E. J. O. Hartert, 1930 – W & C New Guinea (Weyland Mts E to W Hindenburg Mts).
A. m. kombok Schodde & McKean, 1973 – E New Guinea probably from at least Strickland R (possibly from Hindenberg Range) E to Mt Hagen, Kubor Range, Bismarck Range and Kratke Range.
A. m. lecroyae C. B. Frith & D. W. Frith, 1997 – Mt Bosavi, in EC New Guinea.
A. m. amati T. K. Pratt, 1982 – Adelbert Mts, in NE New Guinea.
A. m. germana Rothschild, 1910 – mountains of Huon Peninsula, in NE New Guinea.
A. m. macgregoriae De Vis, 1890 – SE New Guinea from W Kukukuku and Herzog Range E to W Owen Stanley Range.
A. m. nubicola Schodde & McKean, 1973 – E Owen Stanley Range (Mt Dayman and Mt Simpson massifs, and probably E from Mt Suckling), in extreme SE New Guinea.



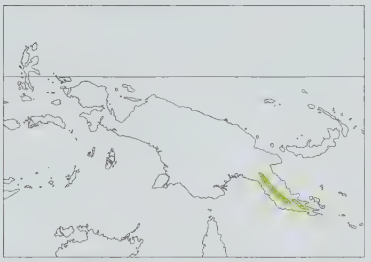
Descriptive notes. 26 cm; male 100–145 g (immature male 110–139 g), female 104–140 g. Male nominate race is dark brownish-olive above, a little paler on face and neck, slightly greyer on lores, with slight orange-reddish wash on crown and darker on mantle and tail; extensive broad, filamentous, elongated, erectile and spreadable crest glossy deep-orange (showing white highlights in some lights), some feathers tipped brown, and brown feathering overlying orange crest base and its lateral edges; variable umber below, darkest on side of breast and outer lower flanks, paler on chin, throat and lower parts; undertail browner, central shafts yellowish; iris dark brown; bill blackish, paler and bluish base; legs dark bluish-grey. Female is similar to male but lacks crest, and has upperparts slightly paler and washed umber, giving more orange appearance. Juvenile undescribed; immature like female, but slightly warmer brownish below and with more distinct dark breast; subadult male like adult female, but with initial signs of crest. Races differ mainly in size and in crest length, but also some plumage variation: *mayri* is largest, with longest crest; *kombok* is similar in size and proportions to nominate, but crest rather densely feathered, throat and upper breast pale brownish-olive, lower breast, abdomen and undertail-coverts bright light buffy brown; *lecroyae* is small and short-tailed, differing from previous in being smaller and darker, and more strongly suffused with orange on head and upperparts; *amati* is smallest race (but only two adult male specimens), with short wing (like *germana*) and tail (like preceding race), has chin to upper breast dark olive-brown, only slightly paler than side of head and forehead; *germana* is like nominate, but on average lighter and fractionally smaller in wing and crest; *nubicola* has entire undersurface uniformly dull coffee-brown, and crest rather densely feathered. Voice. Male at bower site gives loud advertisement vocalizations, including harsh tearing sounds, growls, thudding and tapping sounds, and ventriloquial hollow to clear whistles, as well as avian and other vocal mimicry (including of human-made sounds). Male courtship subsong includes high-quality avian mimicry; flight of adult male about bower produces whirring, which it also mimics vocally.
Habitat. Primary tall mixed montane and southern beech (*Nothofagus*) rainforest, and rarely moss forest or cloudforest; 1000–3000 m, mainly 1600–2300 m. Traditional bower sites regularly and linearly spaced along forested ridges with appropriate slope and width, closure of canopy, and density of saplings adjacent to bower sites. Tree species important to diet are common along ridges and slopes where bowers present.
Food and Feeding. Mostly fruits, also some flowers and animals (mostly arthropods). Nestling diet fruits and arthropods, including cicadas (Cicadidae) and ants (Formicidae). Forages mostly in canopy.
Breeding. Season Sept–Feb; eggs Oct–Jan on Mt Missim (E New Guinea), and a well-incubated egg in early Jul on Mt Hagen; display season extends for up to 9–10 months (May–Feb), peak early Oct, when male bower attendance on average more than 50% of daylight time. Polygynous, promiscuous male seasonally decorating terrestrial bower of simple maypole type; female builds and attends nest alone. Non-territorial except for defence of bower site; median distance adult male travels from bower c. 88 m, but up to 800 m in order to steal decorations; home range c. 150–200 m in diameter and generally elliptical about bower site. Bower consists of conical tower of sticks up to 3 m tall around a sapling or tree-fern trunk, placed atop thick circular, saucer-shaped mossy platform (c. 1 m in diameter) raised at its circumference into elevated rim up to c. 75 cm above inner mat (in Huon Peninsula, race *germana* bowers have broader lower tower section and circular bower mat, on base of which are fibres like those of tree-fern, instead of moss); one Mt Missim bower used for more than 20 consecutive years; on Mt Missim bowers c. 180 m apart; bower decorations include fruits, charcoal, berries and fungi, also many other items, including human-made ones; insect frass and vegetable matter placed on lower central column sticks; bower destruction and theft of decorations occurs. Courtship involves an extra-bower display, male leaping rapidly between vertical sapling trunks, a "hide-and-seek" on bower mat with subsong (Vocal display), wing-flicking and crest-flashing, followed by sudden rush at female in rapid semicircular dance of mincing steps with crest intermittently erected and fanned (Visual display). Nest a sparse stick foundation, with leafy cup, and egg-cup lined with supple twiglets and rootlets, placed 2–3 m above ground in pandanus (*Pandanus*) tree crown, sapling, or tree-fern crown; mean distance of six active nests from nearest active bower 116 m (Mt Missim). Clutch 1 egg; incubation in excess of 17 days; no information on nestling period.
Movements. Resident. Immatures and females may descend to lower elevations in winter months. Females and immature males maintain relatively large, overlapping home ranges throughout year, foraging in same areas as adult males.
Status and Conservation. Not globally threatened. Common and widespread throughout range. Mt Bosavi race (*lecroyae*) known from just nine specimens. In Oct 1999, portable saw-mill logging, and associated cutting of saplings, caused abandonment of at least four traditional bower sites in Southern Highlands (E New Guinea). Crests of adult males formerly used in Papuan headdresses and also in trade; this practice and trade possibly still occur, at least locally.
Bibliography. Bell (1972a), Coates (1990, 2001), David & Gosselin (2002b), Diamond (1972), Diczbalis (1968), Frith (1970a), Frith & Frith (1992a, 1997e, 1998a, 2001b, 2004), Gilliard (1969), Greenway (1935), Hopkins (1992), Kocher-Schmid (1993), Mackay & Cheeseman (1990), Marshall (1954), Mayr & Gilliard (1954), Mayr & Rand (1937), McCarthy (2006), Pratt & Stiles (1983, 1985), Pruett-Jones, M.A. & Pruett-Jones (1982, 1983), Pruett-Jones, S.G. & Pruett-Jones (1985), Rand (1942b), Schodde & McKean (1973a).

6. Streaked Bowerbird

Amblyornis subalaris

French: Jardinier à huppe orange **German**: Rothaubengärtner **Spanish**: Pergolero Estriado
Other common names: Gardener Bowerbird, Striped (Gardener-)Bowerbird, Orange-crested Bowerbird, Eastern (Gardener-)Bowerbird, Eastern Gardenerbird

Taxonomy. *Amblyornis subalaris* Sharpe, 1884, Astrolabe Mountains, south-east New Guinea.
Has hybridized with *A. macgregoriae*. Monotypic.
Distribution. Mountains of SE New Guinea, from upper Angabunga R E to Mt Suckling, Mt Simpson and Mt Moiba areas.



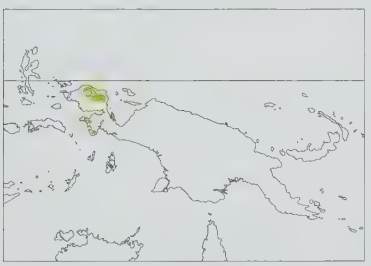
Descriptive notes. 24 cm; male 96–107 g, female 95–122 g. Male has entire face and upperparts warm olive-brown, lores and feathers on each side of crest darker and richer; extensive erectile and laterally spreadable crest rich orange, tips of feathers darker and redder to a deep brown; flight-feather shafts amber; paler below, central portion of chin, throat and upper chest feathers palest, almost tawny-olive, creating indistinct streaking; undertail-coverts slightly darker; underside of tail olive-brown with whitish feather shafts; iris dark brown; bill mostly bluish-grey, blackish basally and along culmen; legs blue-grey. Female is similar to male but crestless; older female may have one to several elongated narrow crown feathers (coloured as on either sex), reminiscent of adult male crest. Juvenile undescribed; immature male like adult female; subadult male has crest smaller and possibly with more brown feathering. Voice. Insufficient information; repertoire evidently similar to that of *A. macregoriae*, but detailed study required.
Habitat. Primary forest and taller secondary forest with *Lithocarpus* and *Castanopsis* oaks in lower montane zone, at 650–1300 m, occasionally to 1500 m. Traditional bower sites on upper steep slopes of ridges c. 5–30 m below a forested ridge crest with secondary growth.
Food and Feeding. Almost unknown, but presumably fruits and insects; frequents forest substage to canopy.
Breeding. Few data on season, a few eggs collected in Dec–Jan; display season Sept–Dec. Polygynous, promiscuous male seasonally decorates complex maypole bower; female builds and attends nest alone. Non-territorial except for defence of bower sites; inter-bower distance c. 50–75 m. Bower a hut-like, teepee-shaped structure based upon central maypole (column of sticks or tree-fern fibres built around thin sapling) with roughly dome-shaped roof of sticks with back and side walls, and an opening at front providing access to semicircular tunnel-like passageway entered on each side of central maypole; bower to c. 80 cm high, 120 cm wide and 100 cm in diameter; bower decorations include small fruits of various colours, flowers and leaves, confined to central column base, and larger items including also beetle (Coleoptera) elytra, tree resin and pieces of fungi on outer mat and top of stick parapet before it, often placed in discrete piles; average male attendance more than 40% of daylight hours; bower destruction and theft of decorations occur. Courtship not fully described, but apparently similar to that of *A. macregoriae*. One nest was a large bowl-shaped structure with long brown dead leaves and few sticks, lined with twigs. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. Widespread and locally common throughout range. Crest of adult males used by Papuans for head-dresses and also in trade.
Bibliography. Coates (1990), Frith (1970a), Frith & Frith (1998a, 2001b, 2004), Gilliard (1969), Harrison & Frith (1970), Marshall (1954), McCarthy (2006), Opit (1975), Schodde & McKean (1973a), Simson (1907), Weiske (1902).

7. Vogelkop Bowerbird

Amblyornis inornata

French: Jardinier brun **German**: Hüttengärtner **Spanish**: Pergolero Pardo
Other common names: Crestless/Plain/Brown (Gardener-)Bowerbird, (Vogelkop) Gardener Bowerbird, Brown Gardener/Gardenerbird, Crestless Gardener

Taxonomy. *Ptilorhynchus inornatus* Schlegel, 1871, Hatam, Arfak Mountains, north-west New Guinea.
Taxonomic status of birds in Fakfak Mts uncertain; compared with those in Arfak Mts, they are slightly darker above and brownish-yellow below, but with grossly different bowers, although genetic material reveals little differentiation; study required. Monotypic.
Distribution. Mountains of Vogelkop (Tamrau, Arfak), Onin Peninsula (Fakfak), Bomberai Peninsula (Kumawa) and Wandammen Mts, in NW New Guinea.



Descriptive notes. 25 cm; male 105–155 g, female 105–146 g. Has deep warm brown crown, paler on sides of head and hindneck, becoming more brownish-olive on rest of upperparts; chin indistinctly scalloped by greyish feather edging; upperparts dark brownish-olive, tinged cinnamon-brown; flight-feathers pale and dilute brownish-olive, broad buff basal trailing edges to all but outer two primaries, inner edges of primaries ochreous, as axillaries (contrasting with dull outer edges in Kumawa Mts, less contrasting in Arfak and Tamrau Mts, least so in Wandammen Mts); tail feathers brownish-olive with pale greyish inner margins; buff to pale cinnamon below, darker, more olive-brown, on sides, undertail-coverts buff; iris dark brown; bill blackish, base of lower mandible paler, slightly bluish; legs deep bluish. Sexes alike in plumage, female on average fractionally smaller than male and with legs darker and less blue. Juvenile undescribed; immature male like adult female; subadult male like adult male. Voice. Male at bower sites gives loud advertisement vocalizations, including wavering whistles, chugging, wheezing, spitting and ratchetting sounds, a sharp click, a "kah kah" repeated at intervals, and a series of "keu keu keu keu" notes; also mimicry of other birds and of human-made sounds; male also has courtship subsong with mimicry.
Habitat. Rainforest with canopy 25–30 m tall and with emergents of *Agathis labillardieri* and *Araucaria cunninghamii*; at 1000–2075 m, mainly 1200–2000 m. Traditional bower sites on ridge spines and flanks with sloping ground; absent from extensive areas of bare karst.
Food and Feeding. Little known. Diet of fruits and insects.

Breeding. Two nests each with single egg in early Oct; display season Jul–Feb, months of peak activity varying across range. Polygynous, promiscuous male seasonally decorating complex or simple maypole bower; female builds and attends nest alone. Non-territorial except for defence of bower sites. Two distinctive maypole bower types, both based around central column of sticks or other material placed around sapling trunk, one type (in mountains of Tamrau, Arfak and Wandammen) a complex hut-like structure, similar to that of *A. subalaris*, with roof of epiphytic orchid stems but sometimes of sticks or fern fronds, column base covered with moss that extends down and out to form frontal mat or lawn, bower to 1·5 m (mostly c. 1 m) tall and 2 m in diameter, other type (in Fakfak Mts and Kumawa Mts) a simple roofless structure built around saplings, similar to that of *A. macgregoriae*, with tower to 2 m tall and basal circular mat to 2 m in diameter; bower mat decorated with discrete piles of colourful fruits and flowers, insect exoskeletons, pieces of charcoal, fungi, and other items, colour and quantity varying greatly from one site to another; bower destruction and theft of decorations occurs. In courtship, male responds to arrival of female by rushing into rear of bower to crouch and hide while producing a subsong, then standing stiff and erect and occasionally running out from concealment to bower entrance, head cocked to one side for a few moments, then dashing back inside again; male sings throughout. Two nests found, both built into forking branches of sparsely foliaged sapling, respectively 1 m and 2·5 m above ground; one nest was an untidy structure of sticks with a leaf lining, like that of *A. macregoriae* but with fewer sticks in base. Clutch at least 1 egg; no information on incubation and nestling periods.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in West Papuan Highlands EBA. Widespread and common throughout range. People near Hatam, in Arfak Mts, avoid destroying bowers of this species.
Bibliography. Astley (1913), Bailey (1996), Beccari (1878), Coates (1990), David & Gosselin (2002b), Diamond (1986b, 1987a, 1988), Frith & Frith (2001b, 2004), Gibbs (1994), Gilliard (1969), Gilliard & LeCroy (1970), Marshall (1954), Mayr & Meyer de Schauensee (1939), Uy (2002), Uy & Borgia (2000).

8. **Yellow-fronted Bowerbird**

Amblyornis flavifrons

French: Jardinier à front d'or **German**: Gelbscheitelgärtner **Spanish**: Pergolero Frentigualdo
Other common names: Golden-fronted Bowerbird, Yellow-fronted Gardenerbird, Golden-fronted/Gold-maned Gardener

Taxonomy. *Amblyornis flavifrons* Rothschild, 1895, "Dutch New Guinea" = western New Guinea. Monotypic.
Distribution. Foja Mts, in N New Guinea.



Descriptive notes. 24 cm. Male has forecrown and conspicuously extensive broad erectile and laterally spreadable crest from beak to mantle brilliant glossy deep yellow, a few top feathers with brown tips; mantle and back dark rufous-brown, upperwing and uppertail brown-olive; side of face, lores, chin, throat and upper chest similar to back, but paler and less reddish; breast and abdomen, undertail-coverts and underwing-coverts rich buff, variably washed with deep cinnamon; iris dark brown; bill blackish; legs bluish-grey. Female (no specimens) resembles male, but without crest. Juvenile undescribed; immature male probably like female; subadult male acquires orange-yellow under-feathers of crest before the more yellow superficial ones. Voice. Male at bower gives loud advertisement vocalizations, including short high nasal screeches, rasps, clucks, wheezes, croaks, crackling, whip-like sounds, and vocal mimicry of birds and human-made sounds. During courtship, a male gave weak high-pitched 2-note whistle; subsong unrecorded.
Habitat. Montane moss forest dominated by *Araucaria*, southern beech (*Nothofagus*), *Podocarpus*, and *Lithocarpus* oaks; 940–2000 m, mainly 1100–1800 m. Traditional bower sites on ridge crests c. 0·5 km apart.
Food and Feeding. Fruits recorded as eaten. Frequents middle storey and lower canopy at 6–20 m, also forest floor.
Breeding. Little known. Presumed polygynous. Non-territorial except for defence of bower sites. Male builds simple maypole bower, tower to c. 1 m high and basal circular mat c. 1 m in diameter; bower decorations include discrete piles of blue, green and yellow fruits, each on a distinct part of bower mat. During one observed display to a presumed female, an adult male held a blue fruit in bill and directed it at female as she moved about bower site; he frequently spread crest laterally, raised and lowered it vertically, and shook his head rapidly from side to side, causing crest to quiver. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in North Papuan Mountains EBA. Has very small global range, within which total population estimated at a few thousand at most.
Bibliography. Beehler *et al.* (2007), Coates (1990), Diamond (1982b, 1982c), Frith & Frith (2001b, 2004), Gilliard (1969), Rothschild (1895).

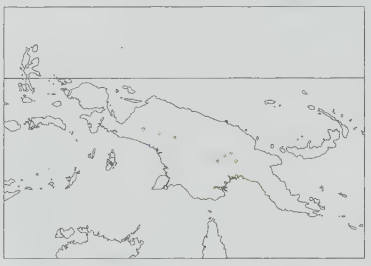
Genus *ARCHBOLDIA* Rand, 1940

9. **Archbold's Bowerbird**

Archboldia papuensis

French: Jardinier d'Archbold **German**: Archboldlaubenvogel **Spanish**: Pergolero de Archbold
Other common names: Black/Gold-crested Black Bowerbird; Sanford's (Golden-crested)/Tomba Bowerbird (*sanfordi*)

Taxonomy. *Archboldia papuensis* Rand, 1940, Bele River, 2200 m, 18 km north of Lake Habbema, Snow Mountains, western New Guinea.
Races long thought to constitute two separate species, on alleged grounds that *sanfordi* was crested and built a "mat" bower and male nominate was uncrested and possibly built an avenue bower; this belief now known to be mistaken, as males of both races have crest and build maypole bower. Two subspecies recognized.
Subspecies and Distribution.
A. p. papuensis Rand, 1940 – mountains of WC New Guinea (Wissel Lakes, in Weyland Mts area; Nassau Range and Oranje Mts; Bele R and L Habbema region).
A. p. sanfordi Mayr & Gilliard, 1950 – mountains of EC New Guinea (Mt Hagen, Mt Giluwe, Tari Gap, and S Karius Range).



Descriptive notes. Male 37 cm, 170–195 g; female 35 cm, 163–185 g. Male nominate race is dark sooty grey to jet-black, with extensive prominent black-streaked orange-yellow crest from forehead to nape and tapering to a point posteriorly; some tapering yellow crest feathers may be umber immediately adjacent to terminal black tip; flight-feathers dark grey-brown, tinged olive or blackish; upperwing blackish, primary coverts sooty brown or jet-black, sometimes with traces of cinnamon; iris dark brown; bill black; legs blue-grey. Female is smaller, particularly in wing and tail lengths, than male; lacks crest, plumage not so black as male's, primary coverts conspicuous cinnamon to yellowish (appearing to form patch on leading edge of wing) and this sometimes lightly to heavily spotted/smudged blackish. Newly fledged juvenile has downy crown, blackish bill, purple-grey legs and dark brown-grey iris; immature male like female, but blacker and lacking paler chin/forecrown; subadult male like adult male, but only few crest feathers intruding into black crown. Race *sanfordi* is slightly larger and longer-tailed than nominate, bill proportionately smaller, plumage blacker (especially in immature and subadult stages). Voice. Male at bower gives loud advertisement vocalizations with ventriloquial quality, including whistles, buzzing, snapping, tearing, and harsh grating or churring sounds; also vocal mimicry of numerous sympatric bird species (at least ten noted) and inanimate sounds within habitat. Subsong during display including bleating calls and mimicry of bird calls, of whirring bird wings and of fluttering vegetation.
Habitat. Frost-prone high montane mossy beech (*Nothofagus*) forest with coniferous (*Podocarpus*) tree species in canopy and pandanus (*Pandanus*) and umbrella trees (*Schefflera*) and scrambling bamboo on gentle topography; at 1750–3660 m, mainly 2300–2900 m. In lower subalpine habitat in Ilaga valley (E range of nominate race) found at 2850–3660 m, this being highest altitude for any bowerbird. Traditional bower sites evenly dispersed within forest patches interspersed with grassland.
Food and Feeding. Virtually no information on adult diet. Nestling diet predominantly fruits, also some animals; latter mostly tree-climbing skinks (Scincidae), as well as insects and pieces of nestlings of other birds. No information on foraging habits.
Breeding. Season Sept–Feb, with eggs Nov–Dec; display season Sept–Dec, but Mt Hagen bowers attended as early as Jul. Polygynous, promiscuous male seasonally decorating arboreal maypole bower; female builds and attends nest alone. Non-territorial, except for defence of bower by male; for 16 traditional bower sites over 1000 ha at Tari Gap (E New Guinea), mean nearest-neighbour distance 370 m. One traditional bower site persisted for more than 15 years and one adult male attended same site for more than six seasons. Bower consists of cleared area (largest 6 × 5 m) on which a mat of fern fronds is accumulated; perches above mat draped with stems of epiphytic orchids, sometimes in flower (these represent bower material, i.e. not decorations), up to 2·6 m above bower mat; average male bower attendance more than 50 % of daylight hours (Tari Gap); decorations include large snail shells, beetle (Coleoptera) wingcases, fruits, fungus, tree resin, and charcoal, placed on mat in discrete collections, also occipital nuptial plumes of adult male King of Saxony Bird-of-paradise (*Pteridophora alberti*). Courtship by male involves two display elements, Prostrate posture and Grovel Display, and he performs various other postures on bower mat while giving subsong; also Displacement-chases female from bower mat until she succumbs to his advances. Nest an untidy large deep, bulky bowl with stick foundation, deep substantial cup of large dried leaves (with uppermost ones still fresh and green), egg-cup lining of curved twiglets, built 3–7 m above ground in leafy crown of sapling within or adjacent to small gap in forest (no canopy directly above); average distance of seven active nests from nearest active bower 250 m; female may nest in same area, sometimes in same tree, for years in succession. Clutch 1 egg; incubation 26–27 days; average nestling period 30 days. Overall success rate for eight nests at Tari Gap 88%; mean number of fledged offspring per female 0·88 per season. Oldest marked adult male lived for at least 6 years.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Central Papuan Mountains EBA. Reasonably common locally; generally rare throughout patchy range. Global population thought to be rather small, and possibly declining as a result of habitat loss. Nominate race in W appears to have larger population and considered probably secure, at least in short term; E race, *sanfordi*, has total range of only c. 800 km², and habitat on two mountains within its range is threatened by logging activities. Habitat disturbance and destruction resulting from increasing human population, and associated logging and habitat degradation, represent potential threats. Fire damage following a severe drought 20 months previously, coupled with human activity, resulted in abandonment of at least six traditional bower sites below Tari Gap.
Bibliography. Anon. (2008k), Butchart & Stattersfield (2004), Coates (1990, 2001), Diamond (1982a, 1986a), Frith, C.B. & Frith, D.W. (1988, 1990b, 1992a, 1993a, 1994a, 2001b, 2004), Frith, C.B., Borgia & Frith (1996), Frith, C.B., Gibbs & Turner (1995), Frith, D.W. & Frith, C.B. (1991), Gilliard (1959a, 1969), Loke Wan Tho (1957), Marshall (1954), Mayr & Gilliard (1954), Peckover (1972), Peckover & Filewood (1976), Ripley (1964), Sims (1956), Stattersfield & Capper (2000).

Genus *PRIONODURA* De Vis, 1883

10. **Golden Bowerbird**

Prionodura newtoniana

French: Jardinier de Newton **German**: Säulengärtner **Spanish**: Pergolero Dorado
Other common names: Newton's (Golden) Bowerbird, Queensland Gardener, Newton's (Gardener-)Bowerbird

Taxonomy. *Prionodura newtoniana* De Vis, 1883, Tully River Scrubs, north Queensland, Australia.
Monotypic.
Distribution. Uplands of wet tropics of NE Queensland (from Thornton Range and Mt Windsor Tableland S to Seaview–Paluma Range), in NE Australia.



Descriptive notes. Male 25 cm, 62–86 g; female 23 cm, 62–96 g. Smallest bowerbird. Male has head, chin and upperparts olive-green, richly suffused with glossy deep golden-yellow (thus appearing rich deep brownish-yellow), small central crown crest and extensive nape patch pure glossy deep yellow (glossy plumage reflecting white highlights in some lights); upperwing more olive with yellow wash; central pair of rectrices and extensive dark tips of adjacent two pairs olive-brown, contrasting with dilute deep yellow of other rectrices; throat and entire underparts and undertail dilute orange-yellow, glossy and variable in intensity on chest, abdomen and belly; iris pale buff, darker at outer edge; bill blackish-brown, paler tip and base; legs blue-grey with olive wash. Female is heavier than male, has considerably shorter tail; plumage radically different, brownish-olive above and much paler, glaucous, below, with paler chin and throat and darker, slightly brownish, side of breast and flanks; iris and bill darker than male's. Newly fledged juvenile has downy crown, plumage similar to female, but darker, less grey, below, less yellow in flight-feathers, iris dark brown, bill and legs blue-grey; immature male like female; some immatures moult directly from female-like to adult male plumage in single moult, others wear discernible subadult plumage (some yellow feathers in otherwise female-like plumage) during season before gaining full adult plumage; one male was immature-plumaged for at least six years before acquiring adult plumage. Voice. Male bower-advertisement song a pulsating rattle note, typically lasting for 1–2 seconds, repeated several times, geographically variable; peak calling Sept–Dec. Other calls at bower site, or elsewhere, include squeals, screeches, scold-rasps, or wolf-whistle notes or a medley of them; also high-quality mimicry of calls of other bird species (more than 20 recorded) and of mechanical sounds. Mimicry sometimes opportunistic; courtship display with soft subsong incorporating high-quality avian and other mimicry.
Habitat. Upland rainforests at 350–1530 m, mainly 700–990 m. Traditional bower sites on flatter terrain and along ridge slopes, gentle slopes, ridges immediately around hill crests, and below steeper slopes where terrain levels off; canopy coverage usually of more than 70%; none on hill tops or in disturbed forest.
Food and Feeding. Mostly fruits, particularly from vines, also flowers, buds, also arthropods. Nestling diet mostly fruits, with some insects, mostly cicadas (Cicadidae), proportion of fruit increasing with age of nestling. Fledglings eat fruits and insects. Males cache fruits, particularly bunches of wild pepper (*Piper*) in Paluma Range, in niches around bower sites to be retrieved for later consumption; one nesting female observed to retrieve a cached fruit. Forages by searching and sallying; occasionally hawks cicadas. Usually feeds alone, but 3–4 (often immature) individuals may do so in same fruiting canopy, sometimes with other bird species, including other bowerbirds.
Breeding. Season Sept–Feb, egg-laying peak Nov–Dec, nestlings Dec–Jan, season lasting c. 4 months; display season Jul/Aug–Jan, ceasing with onset of wet-season rains, also some post-moult bower activity (often by immature males) Mar to early May. Polygynous, promiscuous male decorating large simple maypole bower; female builds and attends nest alone. Foraging male travels mean distance of 143 m from bower site to collect and/or steal decorations from rivals, estimated mean home range of eight adult males 7 ha; from up to five years before gaining ownership of traditional bower, immature visits many bower sites, at average of 391 m from the one eventually occupied, distance diminishing to average 186 m in year before acquiring full occupancy. Traditional bower sites attended for at least 20 years; for 12 traditional bower sites over 50 ha in Paluma Range, mean nearest-neighbour distance 150 m. Traditional bower a single tower or twin towers of sticks, up to c. 2–3 m tall and built around, and supported by, saplings, vines or tree, sticks becoming fused together by fungi (some bower structures survive for more than 20 years), has pre-existing horizontal perch consisting of woody vine, living sapling, fallen dead branch or tree root; small arboreal and/or terrestrial subsidiary stick structures may be built around main bower; during peak season males spend average of 50% of daylight time at bower site; individual male attends same bower site for up to 16 years (average 7 years); bower decorations mainly grey-green lichen and sprigs of creamy-white fruit with attached black seed (of a *Melicope* species), and other creamy-white flowers, placed on platform(s) of tightly aligned sticks formed where tower sticks abut bower perch; theft of decorations occurs. Five basic display elements, Chase, Bow and Head-nod-and-shake on bower perch or nearby ones, Flight-hover around bower (last three displays performed in any sequence and accompanied by brief vocal rattles and squeals), and Hiding (behind tree trunk or bough, accompanied by subsong); once a female settles on bower perch, male may suddenly stop vocalizing and aggressively Displacement-chase her from bower with loud calls. Nest takes up to 25 days to construct, a deep, bulky, open cup with stick foundation, discrete substantial bowl-shaped structure of dead leaves and leaf skeletons, with egg-cup lining of fine supple and springy tendrils, built up to 5 m above ground within "roofed" vertical crevice in tree trunk or crevice-like situation; average distance of 37 active nests from an active bower site 97 m; nest-site may be reused in one or more subsequent seasons. Clutch 1–3 eggs, mostly 2, laid on alternate days; incubation 21–23 days; brooding ceases when nestlings 14–15 days old (irrespective of brood size), nestling period 17–20 days; female performs display to distract predators. Overall success of 29 nests 28%; average of one fledged young produced per female per season. Recorded longevity for male in excess of 23 years, one female at least 14 years; average annual survival rate and expectation of further life over 19 consecutive seasons for 48 males 91% and 10·9 years, respectively (Paluma Range).
Movements. Resident. In Paluma Range, a marked adult female resighted 140 m from original point of capture c. 14 years later. During winter months some individuals in female-like plumage move to lower altitudes.
Status and Conservation. Not globally threatened. Restricted-range species: present in Queensland Wet Tropics EBA. Reasonably common throughout small limited remaining range. Habitat in range fully protected. One adult male remained in attendance of bower while immediate habitat was logged; when bower was destroyed, he built another 8 m from original (15 m from a much-used logging track), and persisted with new bower throughout logging activity and into subsequent years.
Bibliography. Anon. (1890, 1909), Bravery (1970), Chaffer (1958), Chambers & Chambers (1981), Chisholm (1963), Chisholm & Chaffer (1956), Crome & Moore (1989), Frith, C.B. (1989), Frith, C.B. & Frith (1998b, 2000a, 2000b, 2000c, 2000d, 2001a, 2001b, 2001d, 2004), Gill (1970), Higgins *et al.* (2006a), Hilbert *et al.* (2004), Jackson (1909, 1932), Kroon & Westcott (2006), North (1902, 1908, 1909), Pyper (2000), Rowland (2008), Schodde & Mason (1999), Storr (1984), Warham (1962), Westcott & Kroon (2002).


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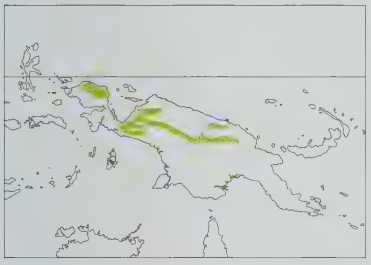
Genus *SERICULUS* Swainson, 1825

11. Masked Bowerbird

Sericulus aureus

French: Jardinier du Prince d'Orange **German**: Goldlaubenvogel **Spanish**: Pergolero Áureo
Other common names: Black-faced (Golden) Bowerbird, New Guinea Golden Bowerbird, Northern Flame Bowerbird, Golden Regentbird

Taxonomy. *Coracias aurea* Linnaeus, 1758, "Asia"; error = Vogelkop, north-west New Guinea.
May form a superspecies with *S. ardens*, *S. bakeri* and *S. chrysocephalus*; often treated as conspecific with first of those, with which it hybridizes in area of marginal range overlap on Wataikwa R (SW New Guinea). Monotypic.
Distribution. NW & N New Guinea, from mountains of Vogelkop, Wandammen Mts, Weyland Mts, Oranje Mts, and C ranges and N coastal ranges (Torricelli Mts, Prince Alexander Mts) E to near Sepik R.



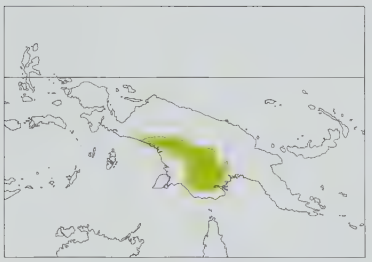
Descriptive notes. 24·5 cm; male 175–180 g, female 165–175 g. Male has head, nape, mantle and side of neck highly glossy brilliant deep orange with pure white highlights, contrasting black facial mask, chin and throat; elongate filamental deep orange upper neck plumage (may fall to either side of neck) and mantle become increasingly suffused with orange, and mid-back, rump and most uppertail-coverts entirely deep yellow; upperwing mostly brilliant deep yellow, area of black spotting just above carpal joint extending to alula and primaries, alula feathers with variable amount of brownish-black on leading edges and terminal part of inner webs; outer primaries blackish-brown, very small area of paler deep yellow at bases, latter becoming progressively larger across primaries; secondaries deep yellow, tipped blackish-brown, darker tipping becoming progressively smaller towards body; uppertail dark blackish-brown, outer rectrices with small, fine deep yellow tips; underparts deep yellow, slightly paler than upperparts, more pale and washed out on undertail-coverts; undertail like uppertail but brown more than blackish, thighs black; iris pale lemon-yellow; bill pale bluish-grey, extensive black tip; legs greyish. Female is less heavy than male, has slightly longer tail; plumage radically different, more olive-brown above and orange-yellow below, and with chin, throat and upper breast washed olive-brown, dark edging on chest feathers (forming obvious scalloping), iris dark brown. Juvenile undescribed; immature male like female, rectrices more pointed than those of subadult/adult male; subadult male also similar to female, but with variable amount of adult male plumage (one or two feathers, to almost all) intruding. Voice. Few records; occasional faint "ksh" notes, harshly rasped note, and odd buzzing during courtship.
Habitat. Hill and middle montane forests at 850–1400 m, occasionally down to 500 m; a few bowers located along ridgetops.
Food and Feeding. Diet little known; fruits, including figs (*Ficus*), also insects. Forages from 12 m above ground to treetops. Forages alone or in small groups, possibly in groups more during winter months; observed in fruiting canopy with *Amblyornis inornata*, and other avian frugivores, without interaction; individual in female-like plumage fed in canopy within a mixed-species flock.
Breeding. Bowers in Vogelkop (Tamrau Mts and Arfak Mts) active Aug–Nov. Polygynous, promiscuous male seasonally building and decorating terrestrial avenue bower. Avenue bower similar to that of *S. chrysocephalus*, but few described; one in Tamrau Mts 18 cm along central avenue and 26 cm from ground to tallest of wall sticks; bower decorations few, up to six, including blue and purple fruits, black bracket fungus, snail shells, and yellow to bronze leaves; unconfirmed if decoration fruits observed to have disappeared were stolen by rivals or eaten by visiting *Ailuroedus melanotis*; "painting" of inside of bower walls recorded. Courtship little known; some postures similar to those of *S. chrysocephalus* and *Chlamydera* species. No other information.
Movements. Presumed resident.
Status and Conservation. Not assessed. Usually treated as conspecific with *A. ardens*. Probably not globally threatened. Little-known species. In W of range, not uncommon in forests of Vogelkop and on N slopes of Snow Mts near Mt Wilhelmina. Dried skins seen at Goroka (extreme E of range) indicated a geographically extensive plume trade until recently.
Bibliography. Coates (1990), Diamond (1969, 1985), Frith & Frith (2001b, 2004), Gilliard (1969), Gilliard & LeCroy (1970), Hartert (1930), Iredale (1950), Marshall (1954), McCarthy (2006), Salvadori (1876).

12. Flame Bowerbird

Sericulus ardens

French: Jardinier ardent **German**: Flammenlaubenvogel **Spanish**: Pergolero Flamígero
Other common names: Golden Bowerbird(!), Golden Regent Bowerbird, Yellow-throated Golden Bird

Taxonomy. *Xanthomelus ardens* D'Albertis and Salvadori, 1879, upper Fly River, 430 m, New Guinea.
May form a superspecies with *S. aureus*, *S. bakeri* and *S. chrysocephalus*; often treated as conspecific with first of those, with which it hybridizes in area of marginal range overlap on Wataikwa R (SW New Guinea). Monotypic.
Distribution. S New Guinea from Wataikwa R–Mimika R and upper Noord R–Endrich R E to upper Fly R, Strickland R and Nomad R, and to near Ludesa Mission (Mt Bosavi); also in Tarara–Morehead area and inland from Merauke (between Kumbe and Merauke R).
Descriptive notes. 25·5 cm; two captive males 120 g and 140 g, five females 127–168 g. Generally like *S. aureus*, but slightly smaller, shorter-tailed, and lacking black facial mask, and with bill finer,



paler and slightly longer. Male has crown, nape and mantle rich and dark glossy flame-scarlet, gloss reflecting white highlights; chin and throat deep yellow; elongate deep orange upper neck plumage (may fall to either side of neck) and mantle become increasingly suffused with orange, and mid-back to uppertail-coverts deep yellow; upperwing mostly brilliant deep yellow, small area of black spotting just above carpal joint (forming black patch); uppertail black, fine yellow edging on some or all rectrices, very faint yellow tips (can be lacking); underparts deep yellow, paler than upperparts, undertail-coverts more pale and washed out; iris bright yellow; bill pale grey; legs blackish. Female is similar in size to male, except for longer tail; plumage radically different, olive-brown above, redder about head, orange-yellow below, chin to upper breast washed olive-brown, slightly darker feather edging on chest feathers (forming only faint scalloping), iris dark brown. Newly fledged juvenile has crown down silvery grey, bare face, bill base and throat bright flesh-pink, underpart plumage soft downy white with faintest yellow wash, thereafter like female but paler, bright yellow underpart feathering intruding into softer, white plumage on each side of central sternum, iris dark grey-brown; immature male similar to adult female; subadult male like adult female, but with few to almost all feathers of adult male plumage intruding into female-like plumage. Voice. Few records; harsh rasping and hissing notes, and oft-repeated churring "shh" or faint "ksh" note.
Habitat. Lowland and foothill rainforest and tall secondary forest, including patches in flat savanna (mainly beneath *Melaleuca* in Trans-Fly). A few bowers were on gently sloping ground in foothill forest, swamp-forest, and tall secondary forest with sparse undergrowth and slender trees, sometimes adjacent to a treefall.
Food and Feeding. Diet little known; fruits and insects. Forages singly, sometimes in twos or threes, and occasionally in company with other avian frugivores.
Breeding. Display season in E of range mostly May–Jul at Nomad R and Aug–Nov near Strickland R. Polygynous, promiscuous male seasonally building and decorating avenue bower. Bower neatly constructed with thicker, shorter sticks in outside bases of walls and finer longer ones within, average dimensions of three bowers 23 cm long, 16 cm wide and 19 cm high externally, avenue 17 cm long and 8 cm wide, and compass orientations at 355°, 55° and 30°; decorations (up to about ten) include blue, purple and brown fruits, purple and white flowers, snail shells, and yellow-brown leaves within avenue, blackish glossy leaves outside it; decoration theft unrecorded, but bower destruction may occur (one bird destroyed a bower, but unknown if it was owner or a rival male); "paint" applied to inside avenue walls. Courtship recently observed at Kiunga (in NE of range): on catching sight of visiting female, male collected some sticks from nearby and began to dance, during which he tried first to make himself appear as small as possible, and then to look bigger by "pumping" himself up (enhancing the effect by spreading his wings); dancing seemed to be signal for female to inspect bower and, when she did, male's dancing intensified; male and female touched bills while both were at the bower. No information on nest and other aspects in the wild; in captivity, clutch 1 egg, incubation period 21–22 days, nestling period 21–23 days (partly artificial incubation period 21 days and nestling period 22 days), juvenile feeding independently 50–56 days after hatching.
Movements. Presumed resident.
Status and Conservation. Not assessed. Usually treated as conspecific with *A. aureus*. Probably not globally threatened. Little-known species. Not uncommon in Wataikwa R area in W of range and in Fly R region in EC part. People of Fly R wore dried skins of adult males, with skins traded to coast and Daru I; a dried skin obtained at Mt Hagen (outside range of this species). Skins of adult males occasionally decorate vehicle rear-view mirrors in Kiunga area; contemporary and future forestry activity of concern in this area.
Bibliography. Bell (1970a), Coates (1990), Diamond (1969, 1985), Frith & Frith (2001b, 2004), Gilliard (1969), Gregory (1997), Jensen & Hammer (2003), Marshall (1954), McCarthy (2006), Plantema & van der Spek (2007).

13. Adelbert Bowerbird

Sericulus bakeri

French: Jardinier de Baker **Spanish**: Pergolero de los Adelbert
German: Rotscheitel-Laubenvogel
Other common names: Adelbert Regent/New Guinea Regent Bowerbird, Baker's/Beck's/Madang/Macloud Bowerbird, Madang Golden Bird, Fire-maned Bowerbird

Taxonomy. *Xanthomelus bakeri* Chapin, 1929, Madang, Astrolabe Bay = Adelbert Mountains, c. 915 m, above Maratambu Village, north-east New Guinea.
May form a superspecies with *S. aureus*, *S. ardens* and *S. chrysocephalus*. Monotypic.
Distribution. Adelbert Mts, NE New Guinea.



Descriptive notes. 27 cm; male 178–183 g, female 164–184 g. Male has rich deep glossy flame-scarlet crown finely spotted and smudged black, nape and extensive glossy filamentous silky cape (arising from lower nape) flame-scarlet at base to mostly deep orange, with gloss reflecting white highlights; upperwing and tail black, deep yellow bases of primaries and secondaries forming conspicuously extensive yellow wing patch; rest of plumage glossy jet-black, this colour extending in narrow band over eye and lower lores to base of upper mandible; iris pale yellowish; bill blue-grey, extensive black tip; legs blackish. Female is similar in size to male, except for longer tail; plumage differs radically, generally brownish-olive above, a little paler about head than elsewhere, and dirty whitish below, variably washed dilute buff and finely barred or scalloped on chin and throat, broadly barred with variable brownish-olive

On following pages: 14. Regent Bowerbird (*Sericulus chrysocephalus*); 15. Satin Bowerbird (*Ptilonorhynchus violaceus*); 16. Lauterbach's Bowerbird (*Chlamydera lauterbachi*); 17. Fawn-breasted Bowerbird (*Chlamydera cerviniventris*); 18. Spotted Bowerbird (*Chlamydera maculata*); 19. Western Bowerbird (*Chlamydera guttata*); 20. Great Bowerbird (*Chlamydera nuchalis*).

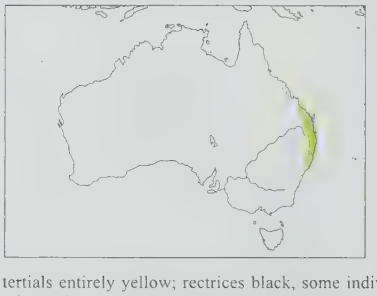
to brownish-grey on underparts; iris and bill dark brown. Juvenile undescribed; immature male similar to adult female; subadult male variable, like adult female but with few feathers of adult male plumage intruding to almost wholly like adult male. Voice. Few records of sharp hissing, rasping and ratchety notes; adult male near his bower gave short churrs and mimicked call of Magnificent Riflebird (*Ptiloris magnificus*) and Magnificent Bird-of-paradise (*Cicinnurus magnificus*). Nest-building female gave quite loud "k-zzz k-zzz" or "tk-sss tk-sss" from above nest-site and nearby trees, and repeated a piping note several times.
Habitat. Hill forest, also secondary growth at rainforest edges; 1200–1450 m, occasionally down to 900 m. One bower on gentle ridge slope c. 60 m below its crest in slightly disturbed primary hill forest, broken canopy permitting more light to bower than typical elsewhere in habitat; second bower also lacked low foliage canopy above it.
Food and Feeding. Fruits, including figs (*Ficus*) and berries, also arthropods, including ants (Formicidae). Forages from middle storey up to canopy; visits fruiting trees in native gardens. Encountered singly, in twos, or in small groups containing many more individuals in female-like plumage than adult males.
Breeding. One nest in Feb, and female with enlarged ovary in Feb; one adult male called at his bower in Sept. Presumably polygynous, promiscuous male seasonally building and decorating avenue bower; female builds and attends nest alone. Small avenue bower like that of congeners, average dimensions of five bowers 28 cm long, 26 cm wide and 33 cm high externally, the avenue 14 cm long and 7 cm wide, and mean compass orientation 251°; bower decorations (up to c. 50) include blue and purple fruits and a yellowish-brown leaf. Courtship undescribed. One nest built in crown of small epiphytic fern on semi-dead tree near a track. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Adelbert and Huon Ranges EBA. Until very recently (2009) listed as Vulnerable. Generally rather uncommon but locally fairly common; possibly sparser at lower end of altitudinal range, but confirmation required. Total extent of range estimated at 570 km², and global population at fewer than 10,000 individuals. Although Adelbert Mts not heavily populated by humans, elevational band in which this species occurs is zone within which local agriculture practised, and for food villagers rely greatly on hunting; in at least some places, however, this species not hunted. Relatively little primary forest remains in region, but extensive areas of mature secondary forest, evidently acceptable to this bowerbird, are available. Much of species' range is comparatively inaccessible, and so less vulnerable to logging. Some further deforestation likely in view of increasing human population, although small-scale clearance for garden agriculture need not pose a major problem.
Bibliography. Anon. (1975, 2009), Bell (1970a), Bender (2000), Butchart & Stattersfield (2004), Chapin (1929), Coates (1990), Frith & Frith (2001b, 2004), Gilliard (1969), Mackay (1989), Marshall (1954), Stattersfield & Capper (2000).

14. **Regent Bowerbird**

Sericulus chrysocephalus

French: Jardinier prince-régent **German**: Gelbnacken-Laubenvogel **Spanish**: Pergolero Regente
Other common names: Australian Regent Bowerbird, (Australian) Regentbird, Golden Regent(bird)

Taxonomy. *Meliphaga chrysocephala* Lewin, 1808, Patterson's River [= Hunter River], New South Wales, Australia.
May form a superspecies with *S. aureus*, *S. ardens* and *S. bakeri*. Two documented cases of hybridization with *Ptilonorhynchus violaceus*. Birds from Blackall Range (SE Queensland) proposed as race *rothschildi* on basis of supposedly richer orange crown of male, but studies indicate no constant geographical difference in this character. Monotypic.
Distribution. Coastal zone of CE Australia from E Queensland (Connors and Clarke Ranges, on Eungella Plateau) S, with distributional gap about Fitzroy R valley inland of Rockhampton, to E New South Wales (to area immediately N of Sydney).



Descriptive notes. 24·5 cm; male 76–110 g, female 91–138 g. Male has forehead, crown, nape and upper mantle brilliant deep yellow, often washed darker flame-scarlet on forecrown; forehead and crown feathers short, dense, plush-like; remaining upperparts and entire underside jet-black, including narrow arching line over eye; two outermost primaries and all upperwing-coverts matt black, remainder of primaries largely golden-yellow with broad to narrow black tips and leading edges, secondaries (lacking black leading edges) with black tipping becoming smaller towards innermost feathers, latter and most tertials entirely yellow; rectrices black, some individuals with fine central yellow terminal tips, others with yellow on outer edges of inner webs of some rectrices; iris bright yellow; bill orange-yellow; legs blackish-brown. Female is on average larger than male in weight and body, but not in bill length; plumage differs radically, variable dull dirty off-white to drab grey on head, which finely streaked, mottled and smudged and with contrasting dull sooty-black crown patch, upperparts variably olive-brown, mantle spotted off-white, dirty off-white to creamish below, broad central line of dull sooty-black feathers down throat, underparts broadly barred blackish-brown; old females may have darker forehead, and may show some plumage characters of adult male; iris dark brown, bill blackish. Newly fledged juvenile has well-developed wing feathers and down persisting on crown, nape and mantle, this then replaced by soft and loosely textured plumage resembling immature of both sexes, one-month-old juvenile has striking crown and nape pattern, dark brown iris, blackish bill, light grey legs; immature male like female, acquires adult plumage, iris and bill coloration gradually (mostly during fourth and fifth years); subadult male (by sixth year) variable, like immature male with few feathers of adult plumage intruding to like adult male with few feathers of immature plumage remaining, and with almost completely yellow eye and orange bill, full adult plumage gained in seventh year; female in first post-juvenile plumage more densely/heavily scalloped and barred ventrally than adult, black crown bordered around nape with narrow line of dark grey, retains typical brown plumage and dark bare parts and iris to third year, but by end of fourth year iris may be yellow with brown mottling. Voice. Away from bowers the least vocal member of family; in courtship gives typical harsh grating notes and continuous subsong of avian mimicry.
Habitat. Subtropical rainforest, associated sclerophyll woodland, and more open habitats, including cultivated country and urban gardens; sea-level to 900 m, altitudinal limits varying across range. Traditional bower sites dispersed through appropriate ridgetop habitat; tend to be within rainforest on flat or less sloping ground, with immediate liana-thicket cover providing concealment and protection.
Food and Feeding. Mostly fruits, also flowers (buds, petals, nectar), seeds, leaves, and arthropods (mostly insects); most leaf-eating during Jul–Oct non-breeding season. Nestling diet fruits and insects; insects include cicadas (Cicadidae), caterpillars, katydids (Tettigoniidae) and beetles (Coleoptera), cicadas representing significant dietary component. Forages mostly in upper levels of trees. Catches arthropods primarily by gleaning and hawking. Often forages alongside other bowerbirds and other fruit-eating bird species, actively displaces other species from fruiting trees; females dominate males at feeding trees; sometimes forms mixed-species foraging flocks with *Ptilonorhynchus violaceus* and Pied Currawongs (*Strepera graculina*).
Breeding. Season Sept–Feb, peak in egg-laying Nov–Dec, fledging late Feb to early Mar, nesting cycle c. 3–4 months; display season Sept–Jan on Sarabah Range, earlier at some other localities. Polygynous, promiscuous male building and decorating small avenue bower; female builds and attends nest alone. Non-territorial, except for defence of bower site by male, which may attend same site for at least three seasons; for 24 traditional bower sites in Sarabah Range (Queensland), mean nearest-neighbour distance 195 m. Bower a sparse, frail avenue of sticks (sticks touching each other often become fused by whitish fungus), mean dimensions of 33 bowers (Sarabah Range) 23 cm long and 20 cm wide externally, avenue 8 cm wide and 18 cm high, average deviation of 44 avenues from N–S compass orientation 38°; male spends only c. 3% of daylight time at bower site; bower decorations (up to c. 30) include green leaves, pale flowers and petals, seeds, fruits, snail shells, cicada nymph ectoskeletons, and human-made blue items; "painting" of bower and theft of decorations occur; bower structure often short-lived (ten days or less), as regularly destroyed by rival males, or by owner when a rival known to have found it, new bower takes c. 3–4 hours to build (beneath different thicket within same site). Male attracts females in upper forest canopy by means of his bright plumage (rather than, as with other bowerbirds, vocalizations), then leads females to bower site; male courtship consists of three display elements, Initial Bower Display at avenue entrance to bower, Peripheral Bower Display around bower, and Central Bower Display within bower avenue; display postures include wing-flicking, gaping, Nape-presentation postures, and male also charges at female and makes brief vertical "flights", all presenting/enhancing plumage coloration. Nest a frail shallow saucer of loosely placed sticks, egg-cup lining of finer twigs and occasionally a few leaves, cryptically sited 2–31 m above ground in dense foliage of clump of vines, mistletoes (Loranthaceae) or other plant; mean distance of four active nests from nearest active bower was 266 m (closest 20 m). Clutch 1–3 eggs, mostly 2, in captivity laid on alternate days; in captivity, replacement clutch laid in new nest after failure; incubation c. 17–21 days, nestling period 17 days. Overall success of seven nests in Sarabah Range 43 %. Female may first breed in third year, more often in fourth year. Maximum recorded longevity of male at least 23 years.
Movements. Resident. Localized movement to lower altitudes may occur during winter months; individuals in female-like plumage said to make such movements 3–4 weeks earlier than adult males. Of 22 marked individuals recaptured, longest distance travelled was 4 km.
Status and Conservation. Not globally threatened. Restricted-range species: present in Eastern Australia EBA. Locally common or moderately common in larger forest "islands"; uncommon in small remnants. Numbers have diminished in several areas as a result of habitat loss and degradation. Once common about Sydney, but S limit of range now Gosford/Hawksbury R area of New South Wales. Break in distribution in N of range from near Casino to Woolgoolga, with small isolated populations at Iluka and Washpool; absent from Guy Fawkes R valley, where former presence may have linked populations; absence from Comboyne Plateau and Hunter Valley (New South Wales) probably result from clearing of rainforest. Adult males were once hunted for mounting as household novelties, and common in cabinets of mixed birds. Most populations appear fairly stable today.
Bibliography. Anon. (1984), Baker *et al.* (1999), Barden (1977), Barker & Vestjens (1990), Blakers *et al.* (1984), Brown (1956), Campbell (1901), Carney (2002), Chaffer (1932, 1984), Church (1997), Disney (1971), Disney & Lane (1971), Frith (1995a), Frith & Frith (2001b, 2004), Frith & Nevill (1998), Gilbert (1910, 1913), Gilliard (1969), Goddard (1947), Higgins *et al.* (2006a), Howe (1986), Lane (1989), Lenz (1994, 1999), Lindsey (1984), Male & Roberts (2002), Marshall (1954), McAllen & Bruce (1988), McCarthy (2006), North (1902), Pallister (1985), Phillipps (1905, 1906, 1907, 1911), Plomley (1935), Roberts & Ingram (1976), Rowland (2008), Schodde & Mason (1999), Sindel (1989), Storr (1984), Threlfo (1985), Veselovský (1979).

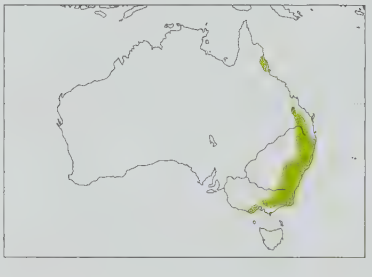
Genus *PTILONORHYNCHUS* Kuhl, 1820

15. **Satin Bowerbird**

Ptilonorhynchus violaceus

French: Jardinier satiné **German**: Seidenlaubenvogel **Spanish**: Pergolero Satinado
Other common names: Satin-bird

Taxonomy. *Pyrrhocorax violaceus* Vieillot, 1816, "Nouvelle Hollande" [= Sydney, New South Wales], Australia.
Two documented records of hybridization with *Sericulus chrysocephalus*. Two subspecies recognized.
Subspecies and Distribution.
P. v. minor A. J. Campbell, 1912 – wet tropics of NE Queensland (from Mt Amos, just S of Cooktown, S to Seaview–Paluma Range), in E Australia.
P. v. violaceus (Vieillot, 1816) – SE Queensland (Dawes Range, just S of Fitzroy R at Rockhampton) S in coastal zone (less than 250 km broad at widest point) to S Victoria (Otway Range, immediately W of Melbourne).



Descriptive notes. 32·5 cm; male 173–290 g, female 170–258 g. Male nominate race is entirely glossy indigo-blue, showing violet highlights to black in some lights; glossy tips and edges of tertials and upperwing-coverts contrast against exposed duller blackish bases (in some lights); primaries blackish; uppertail blackish, tips and outer edges of each feather with strong indigo-blue gloss; lower belly and thighs less glossy, a little more blackish, than rest of underparts, undertail-coverts blackish with strong glossy edges; iris vivid purple, deep blue at outer edge; bill whitish, or pale yellowish-green with blue wash at base; legs vari-

ably pale-coloured. Female is on average lighter in weight than male and has longer tail; plumage radically different, variable ashy grey-green upperbody relieved by cinnamon-brown wings and uppertail, green below, whitish striations to streaks on chin, throat and upper breast becoming paler downwards, fading to off-whitish, scalloped and barred with greenish; iris deep blue, bill blackish, legs usually rather pale, flesh-coloured to grey. Juvenile has crown softly textured brownish-olive, washed greenish, upperparts brown, off-white below, feathers of chest edged dark grey-brown and those of remainder with broad chevrons and fine edges of same colour, giving scalloped appearance; immature male like female for first three years, but with markedly more pointed rectrices, in fourth to fifth years generally becomes discernibly like adult male through acquisition of increasingly green breast and throat (intermediate-plumaged immature), with increasing age ear-coverts become darker and browner and broad band on upper chest (from directly beneath throat) becomes more yellowish and with chevrons finer, darker (to almost blackish) and denser (latter diminish with subsequent moults, to leave this area more solidly green with almost whitish central feather shafts), dark bill starts to show paler areas; subadult male in sixth year with irregular and variable amounts of blue-black feathering often mottled by patches of green contour feathers, and some dark flight-feathers; female gains adult plumage with first post-juvenile moult. Race *minor* is smaller than nominate, and in female-type plumage has dull bluish-grey cast above. Voice. Bower-advertisement song of adult male a clearly whistled "quoo-eeeew"; also loud harsh churring notes and other vocalizations, including mimicry (avian and human-made sounds); odd mechanical buzzing, and a subsong with avian mimicry during courtship. Nesting female mimics calls of potential predators; flocks vocally conspicuous in non-breeding season.

Habitat. Rainforest, with strong preference for edges, also woodland, adjacent tall sclerophyll woodlands with sapling understorey; winter flocks also in open habitats (parks, fruit orchards, and gardens). Traditional bower sites evenly dispersed through suitable rainforest and woodland.

Food and Feeding. Mostly fruits, but some flowers (petals, stamens and nectar), leaves, seeds, and animals (mostly insects). Nestling diet 95% insects, particularly scarab beetles (Scarabaeidae) and cicadas (Cicadidae), few small fruits; fledglings fed on insects and fruits. Forages at all levels. Fruits mostly plucked in canopy 18 m or more above ground; takes animal items by gleaning and sallying, rarely hawking. Forages alone or with other members of family and other frugivorous bird species; adult males dominate younger birds at food sources. During display season male forages closer to bower, within 50 m, and feeds more on insects; female forages mostly within 100 m of nest. During winter months in flocks of up to 200 individuals, which fly to pastures to graze on grassy shoots, succulent white clover leaves, herbaceous plants; also visit gardens and orchards to eat green vegetables, soft fruits, and nectar. Several individuals of race *minor* foraged in figs, eucalypts (*Eucalyptus*) and paperbark trees (*Melaleuca*) in late May at Julatten (c. 7 km from rainforest); at same site, subadult male seen to fight with and dominate up to three *Chlamydera nuchalis*.

Breeding. Season late Aug/Sept–Jan, egg-laying peak Nov–Dec, young leave nest by late Feb, cycle lasts c. 3·5 months; display season starts May–Jul, peak bower attendance Aug–Oct (when adult male spends c. 70% of daylight within 50 m of bower), activity declining late Nov to Dec. Polygynous, promiscuous male building and decorating avenue bower; female builds and attends nest alone, range of each female encompassing about five bower sites and female visiting at least three males. Bower site can be in continuous use for more than 30 years, one occupied by same male for at least 15 years. Non-territorial, except for defence of bower site by male; mean nearest-neighbour distance for 24 traditional bower sites along rainforest edge 284 m and for 43 in woodland 311 m (Beaury State Forest, in New South Wales), and for 34 sites in rainforested area with much regrowth and adjacent cleared and disturbed areas average 183 m (Bunya Mts, in Queensland). At start of display season, adult male builds new bower on or adjacent to spot used in previous season, bower of two outwardly curving parallel walls of sticks placed upright into foundation platform of fine sticks and grass straws on ground, walls may form arch as uppermost twigs meet and intermesh above avenue, area of platform sticks laid upon ground court extends beyond avenue (bowers with third wall, thus forming two avenues, occasionally occur), bower can comprise more than 2000 sticks; mean dimensions of 36 bowers 31 cm wide and 23 cm high externally, avenue 26 cm long and 14 cm wide, and area of sticks laid upon ground (each platform) extending beyond avenue entrance 45 cm (Beaury State Forest); bowers of race *minor* smaller and typically have avenue floor (sometimes also one or both platforms) lined with fresh green moss; avenue mostly orientated along or close to N–S axis; decorations (up to 200 or more) placed on platform outside one or both avenue entrances, include mostly blue feathers, notably flight-feathers of Crimson Rosellas (*Platycercus elegans*), flowers, fruits, and cicada and spider ectoskeletons, skulls, brownish snail shells, sloughed snakeskin pieces, and much more (including both natural and human-made items); "paint" applied to inner bower walls with ground charcoal, masticated foliage, liverwort, crumbly tree bark, fruits mixed with saliva; theft of decorations and bower destruction common. Adult male displays alone to females in ritualized progression of movements and postures (displays also to immature or subadult males, or when alone, but in less ritualized way); courtship involves two display elements, the first an active one involving vocalized buzzing accompanied by body movements with rapidly and vigorously repeated opening and closing of wings while picking at/up decoration (male mostly hidden from female's line of sight) interspersed with struts/strides across and directly in front of avenue entrance (i.e. in view of female), second one static and involving male in continuous vocal mimicry and raising and lowering himself on flexing legs; also presents nape to female while holding decoration in bill; if female solicits, by crouching and vibrating lowered wings and raising rump, male enters far avenue entrance to mount her from behind. Nest takes 1–2 weeks to build, a shallow saucer of sticks and twigs with egg-cup lining of green and dry leaves, built mostly 2–40 m (average 15 m) above ground in tree or bush; mean distance from nearest active bower of 14 active nests in rainforest 122 m and of eleven nests in woodland 313 m (Beaury State Forest), corresponding figure for nests in rainforested area with much regrowth and adjacent cleared and disturbed areas 85 m (Bunya Mts); nesting site may be repeatedly reused by same female. Clutch 1–3 eggs, mostly 2, probably laid on alternate days; replacement laid if first clutch lost, but second successful brood recorded only once (when insect food atypically abundant); incubation 21–22 days; brooding by female declines after day 13 of nestling life, but continues at low intensity until nestlings fledge (irrespective of brood size), nestling period 17–21 days; female allocates much time to anti-predator behaviour, aggressively chasing away conspecifics and potential predators, adopts frozen posture until danger passes, performs "broken-wing" distraction display while mimicking calls of potential predators; one female fed brood of two at 59 days after they left the nest. Overall success of five nests 25%, each female producing average of 0·35 fledged young per season (Beaury State Forest). Longevity of both sexes at least 20–30 years.

Movements. Mainly resident. Some individuals, particularly those in woodlands, move into more open habitats during winter months to form flocks; during non-breeding period adult males travel more than 1 km from bower site, when males have extensively overlapping foraging ranges. Some localized seasonal movements to lower altitudes during winter. Two individuals found, at different locations, 68 km from where initially marked.

Status and Conservation. Not globally threatened. Common to reasonably abundant in remaining habitat. Much habitat already lost to human exploitation, and some populations in decline. Otway Range population now cut off from main one W of Melbourne; break in distribution of nominate race at Hunter Valley probably due to clearance of rainforest, and Iluka population isolated. Few data on adult male home ranges, but those of six immature males had estimated average of 13·7 ha (Bunya Mts); home range of breeding female in typical years c. 13–14 ha (Bunya Mts), and roughly twice this size in particularly dry seasons. Occurred locally until early 1950s in Australian Capital Territory, where recent increases noted in suburban gardens and parks (developed since mid-1970s), initially only birds in female-like plumage involved during colder winter months, but subsequently summer visitors, adult males and bower-building and bower attendance recorded, most bower activity in winter (when more birds present); first recorded successful breeding there Nov–Dec 2000.

Bibliography. Anon. (1998b, 2003c), Baird (1991b, 1992, 1993), Baker *et al.* (1999), Barker & Vestjens (1990), Blakers *et al.* (1984), Blunt & Frith (2005), Borgia (1985a, 1985b, 1986, 1993), Borgia & Collis (1989), Borgia & Gore (1986), Bravery *et al.* (2006), Calaby (2000), Campbell (1901), Chaffer (1931a, 1945, 1959, 1984), Church (1997), Cole (1910), Coleman *et al.* (2004), Collis & Borgia (1992, 1993), Donaghey (1981), Doucet & Montgomerie (2003), Edwards (1920), Fleay (1943), Frith (2006), Frith & Frith (2001b, 2004), Gannon (1930), Gilbert (1939, 1940), Gilliard (1969), Griffiths & Holland (2001), Higgins *et al.* (2006a), Hirst (1944), Holland (1998, 1999, 2000, 2001, 2003a, 2003b, 2004), Holland & Veerman (2000), Hunter & Dwyer (1997), Hyem (1968), Lane (1995), Lenz (1999), Loffredo & Borgia (1986), Male & Roberts (2002), Marchant (1986a, 1992), Marshall (1931, 1932, 1934, 1951a, 1954), Maxwell (1999), Maxwell *et al.* (2004), McAllan & Bruce (1988), McCarthy (2006), McNamara (1955), North (1901, 1902), Nubling (1939), Patricelli *et al.* (2002, 2004), Pratt (1974), Reynolds *et al.* (2007), Robson (2003), Rowland (2008), Ryan (2004), Schodde & Mason (1999), Storr (1984), Upton (1968), Uy (2000), Uy *et al.* (2000, 2001a, 2001b), Vellenga, R.E. (1963, 1966a, 1966b, 1970, 1980a, 1980b, 1986), Vellenga, S. & Vellenga (1985), Veselovský (1979), Warham (1962), Whatman (2001), Wojcieszek *et al.* (2006).

Genus *CHLAMYDERA* Gould, 1837

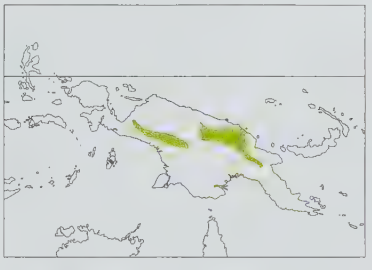
16. Lauterbach's Bowerbird

Chlamydera lauterbachi

French: Jardinier de Lauterbach **Spanish**: Pergolero de Lauterbach
German: Dreigang-Laubenvogel
Other common names: Yellow-breasted/Yellow-bellied Bowerbird; Uniform Bowerbird (*uniformis*)

Taxonomy. *Chlamydodera lauterbachi* Reichenow, 1897, Jagei River, upper Ramu, eastern New Guinea.
Two subspecies recognized.

Subspecies and Distribution.
C. l. uniformis Rothschild, 1931 – C New Guinea from Siriwo R (E of Geelvink Bay) E to upper Ramu R and to Okapa–Aiyura area of Eastern Highlands.
C. l. lauterbachi Reichenow, 1897 – Aiome area of upper Ramu R, possibly also near Bogadjim (in Finisterre Mts), in NE New Guinea.



Descriptive notes. 27 cm; male 128–135 g, female 112–120 g. Male nominate race has yellowish olive-green head, obvious silky-rose crown with coppery sheen; feathering of face side and neck conspicuously streaked (pale shaft and adjacent web); upperparts brownish-olive with slender pale feather shafts and pale buff-yellow to olive feather edging (scalloped appearance), uppertail-coverts slightly more yellowish; upperwing-coverts and flight-feathers dusky brown-olive with pale outer edging and much off-whitish to yellowish broad tipping, and larger spotting on tips of flight-feathers; uppertail feathers similar to flight-feathers, but outer edges of outer rectrices more yellow towards base; chin to upper breast greyish to pale yellow, feathers strongly edged dusky grey-brown or olive; remaining underparts yellow, with indistinct pale brown-grey barring on side of breast to flanks; iris dark brown; bill black; legs brownish to greyish. Female is similar to male but duller, with less yellow-olive on crown, slightly paler upperparts, more buff-yellow below, also lighter in weight and slightly shorter-winged. Newly fledged juvenile is like adult, but more streaked above, chin to breast, flanks and abdomen soft downy off-white with grey mottling, pale yellow wash on central abdomen; immature male like adult female; subadult male has few to nearly all reddish feathers intruding into crown. Race *uniformis* (only two specimens) differs from nominate only in having crown yellowish olive-green, not coppery. Voice. Bower-advertisement song and calls of adult male sharp "chilp chilp chilp" and rasping, grating, churring, rattling and hissing sounds; mimics environmental sounds, but avian mimicry recorded only for captives. In courtship gives soft pathetic notes and churring calls.

Habitat. Lowland and middle montane secondary growth, remnant forest patches and forest edges, overgrown gardens and associated or adjacent bushy grasslands, pit-pit (*Miscanthus floridulus*), canegrass-swamps, coffee plantations, and casuarina (*Casuarina*) stands; sea-level to 1800 m. Traditional bower sites amid dense vegetation under large bushy trees just within edge of forest or forest patches, and immediately adjacent to kunai (*Imperata*) or pit-pit grassland with dispersed shrubs and trees.

Food and Feeding. Little known. Fruits and insects, including caterpillars and beetles (Coleoptera); one young was fed with insects. Typically occurs singly or in small parties.

Breeding. Breeds in all months except May, eggs in Apr and Jun–Jan; display season Apr–Jan. Polygynous, promiscuous male building and decorating elaborate avenue bower; female builds and attends nest alone. Non-territorial, except for defence of bower sites by male; bowers c. 0·5–1 km apart, on level ground, atop small rise, beneath bushes, and in marshy areas (where substantial stick bower base may serve as an island). One bower site used for more than ten years. Avenue bower unique in having four walls built upon substantial stick and cane base, main walls angled outwards (rather than vertical or arched over avenue), at each end of avenue platforms extensively developed into additional walls that form cross-passages at right angles to central avenue; consists of up to 3000 sticks, lined with 1000 or more strands of brownish grass, mean dimensions of bower 64 cm long, 67 cm wide and 43 cm high, of main avenue 23 cm long and 10 cm wide, mean size of exposed stick platform at each end of avenue 84 cm long and 17 cm deep, no favoured orientation of central avenue apparent (Baiyer valley, in E of range); bower decorations (up to 1000 or more) mostly grey to blue-grey river-washed pebbles and large spherical blue quandong fruits (*Elaeocarpus*) placed against/into sticks of inner end walls and in central avenue, smaller red decorations placed on bower floor, charcoal used if stones rare; "painting" of bower and bower destruction occur. Courtship involves several display elements, including Nape-presentation (despite unadorned nape), with or without a decoration

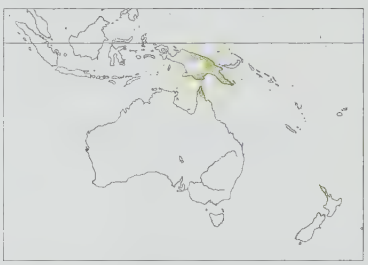
(typically a red fruit) held in bill, with simultaneous soft vocalizations; an Upright posture with sharp wing-flicks, accompanied by loud hissing as bill widely opened towards female to expose orange mouth; sharp jerking of head up and down and flicking of tongue in and out; reminiscent of behaviour of congeners and *Sericulus chrysocephalus*. Nest a neat, compact shallow cup of fine twigs, vine tendrils, dried grasses and bark upon sparse foundation of dry sticks, built 1–4 m above ground, mostly in tree, bush, sapling or grass; mean distance of four active nests from nearest active bower 204 m (Baiyer valley). Clutch 1 egg; no information on incubation and nestling periods.
Movements. Resident.
Status and Conservation. Not globally threatened. Can be locally fairly common and conspicuous, yet scarce elsewhere. Common to abundant in mid-mountain valleys of Wahgi R and Baiyer R, but uncommon on Sepik R; common in savanna and woodland of the drier Ramu valley. Distribution patchy in grasslands in mountains (Weyland Mts, Snow Mts and Star Mts) and in Central and Eastern Highlands, including Mt Hagen suburbs. Single records for Bewani Mts, in North Coastal Range, and in lower Jimi valley.
Bibliography. Bell (1967), Chaffer (1949), Coates (1990), Diamond (1972), Diczbalis (1974), Forshaw & Cooper (1977), Frith & Frith (1989, 2001b, 2004), Gilliard (1969), Gilliard & LeCroy (1966, 1968), Gyldenstolpe (1955a), Marshall (1954), Mayr & Gilliard (1954).

17. Fawn-breasted Bowerbird

Chlamydera cerviniventris

French: Jardinier à poitrine fauve **Spanish**: Pergolero Pechipardo
German: Braunbauch-Laubenvogel
Other common names: Buff-breasted Bowerbird

Taxonomy. *Chlamydera cerviniventris* Gould, 1850, Cape York, north Queensland, Australia.
Both sexes of Australian population heavier than New Guinea ones, but differences considered insufficient to warrant naming of geographical races. Monotypic.
Distribution. NW & E New Guinea (Ransiki and Kebar valleys, in E Vogelkop; and coasts from Jayapura in N and, in S, from Merauke E, including isolates in Jimi valley and Aiyura valley, to SE mountains); and N Queensland (from N tip of Cape York Peninsula S on in E coastal zone to Massy Creek area, E of Coen), in extreme NE Australia.



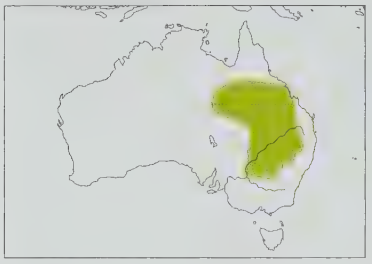
Descriptive notes. 29 cm; male 145–182 g, female 117–170 g. Plumage is brownish-olive above, slightly paler and greyer on crown, with pale dirty off-white to buff shaft streaks and spotting on feather centres and tips, latter more buff on rump and uppertail-coverts; forehead, lores, side of face and neck irregularly marked with off-whitish streaking and feather tipping; flight-feathers and tail like upperparts, primaries, secondaries and tertials with pale buff leading edges, rectrices with similarly pale outer edging and broad tips; chin, throat and chest pale buff, feathers broadly edged dusky grey-brown to produce streaking, especially across chest; remaining underparts clean pale cinnamon; underside of flight-feathers pale brownish-grey; in worn plumage, lacks larger pale tips on back and wing-covert feathers; iris dark brown; bill blackish; legs greyish-brown to blackish. Sexes alike in plumage, male slightly heavier than female. Juvenile undescribed; immature first-year plumage distinguished from adult by rounder outer web of first primary, more crown spotting, and more fulvous colour of back spotting; subadult like adult. Voice. Bower-advertisement song and other calls of male varied harsh churring, sputtering and rattling with repeated loud, harsh, drawn-out rasping or hissing notes and slurred hollow whistles; has ventriloquial qualities and includes avian and other mimicry. Soft but harsh vocalizations uttered, including mimicry of other birds, during courtship.
Habitat. In New Guinea found in lowland to hill forest patches and in eucalypt–paperbark (*Eucalyptus–Melaleuca*) woodland in savanna and other light woodland and scrub in extensive savanna and grassland, or forest and mangrove edges abutting it; also larger grassy areas within forest, and in parks, gardens and teak (*Tectona*) plantations; sea-level to 500 m, locally to 1700 m. In Australia occupies mangroves and *Melaleuca* bordering them, as well as open and closed forest (where it meets *C. nuchalis*); sea-level to 100 m. Traditional bower sites beneath low bushes in open savanna or woodland, just inside edge of gallery forest or mangroves, or within tall secondary growth.
Food and Feeding. Little known. Diet fruits and insects. Nestlings fed with fruits and insects, including caterpillars and beetles (Coleoptera). Forages mostly in trees and shrubs. Observed to sally-hover to snatch fruit. Solitary, in twos and in small groups.
Breeding. Breeds in all months in New Guinea, peak months varying regionally, and in Sept–Dec, laying mostly Nov, in Australia; display season 8–9 months of each year, mainly Jun–Dec. Polygynous, promiscuous male building and decorating avenue bower; female builds and attends nest alone. Non-territorial, except for defence of bower site by male; average distance between bowers 500 m. Male builds new bower every season within same site, often in same undergrowth, close to previous one; bower avenue built atop substantially deep, long base of sticks that extends beyond each avenue entrance to form elevated platforms (one usually larger and better formed than the other), varies in size and dimensions, base up to 170 cm long, 80 cm wide and 60 cm thick, avenue atop this up to 36 cm long and 28 cm high externally, with central avenue 9 cm wide, avenue compass orientation variable; bower decorations (up to 100 or more) include green fruits, usually in small bunches, seed pods, unopened flower buds, and green leaves; male "paints" bower, and bower destruction occurs. Courtship not well known, but postures include Nape-presentation, in part similar to that of *C. lauterbachi* and other congeners; bunch of fruits sometimes held in bill; soft but harsh vocalizations, including avian vocal mimicry. Nest a fairly large foundation of sticks, vine tendrils, sometimes with strips of bark, lined with finer twiglets, a few curly vine tendrils and/or sometimes dry grass stems, built up to 10 m above ground in large tree, bush or shrub, or in mangrove; mean distance of six active nests from nearest active bower 143 m; site may be reused habitually over years. Clutch 1 egg; no information on incubation period; one nestling in nest 21 days before leaving it.
Movements. Resident.
Status and Conservation. Not globally threatened. Patchily common; otherwise scarce to absent. Some upland New Guinea localities possibly colonized following habitat modification brought about by agriculture; e.g. local populations in Jimi valley (c. 145 km inland), and Aiyura valley both at 1700 m. Isolated populations in Ransiki and Kebar valleys (E Vogelkop) poorly known. Fairly common in small range in NE Australia.
Bibliography. Bailey (1992), Bell (1969b, 1982d), Coates (1990), Frith (1987b), Frith & Frith (1989, 1993d, 2001b, 2004), Gilliard (1959b, 1969), Gilliard & LeCroy (1968), Harrison & Frith (1970), Hartert (1930), Hicks (1988), Higgins *et al.* (2006a), Hoogerwerf (1964, 1971), MacGillivray (1918), Mackay & Mackay (1974), Marshall (1954), Mayr & Rand (1937), Mees (1982), Menzies (1976), Peckover (1969, 1970), Peckover & Filewood (1976), Rand (1942a), Rowland (2008), Schodde & Mason (1999), Silva (1970).

18. Spotted Bowerbird

Chlamydera maculata

French: Jardinier maculé **Spanish**: Pergolero Moteado Oriental
German: Fleckenlaubenvogel

Taxonomy. *Calodera maculata* Gould, 1837, "New Holland" = Liverpool Plains, New South Wales, Australia.
Probably forms a superspecies with *C. guttata*, and in the past considered conspecific. Hybridization with *C. nuchalis* recorded SE of Charters Towers (E Queensland). Monotypic.
Distribution. Interior of Queensland S of 20° S (except extreme W & SW) and interior of W & C New South Wales (except extreme W border country) S to extreme NW Victoria, in E Australia.



Descriptive notes. 29 cm; male 125–150 g, female 124–162 g. Has variable warm buff head striated and streaked with warm greyish, forecrown feathers having blackish margins, a few elongate central crown feathers finely tipped silvery white; erectile filamentous pink nuchal crest (with pink-orange highlights), directly below which a discrete patch (or "halter") of plain brown; upperparts, including upperwing-coverts and tail, variably blackish-brown with extensive terminal and/or subterminal amber to clay-coloured feather spotting, which becomes paler (to buff or dirty white) on tertials, secondaries, some primaries and rectrices; fine outer edges of flight-feathers pale buff, remainder being paler blackish-brown than upperparts; chin, throat, ear-coverts and breast tawny-olive to buff, finely streaked and (mostly) barred with dusky warm greyish; rest of underparts pale buff to cream-coloured, scalloped and barred drab greyish, a dilute pale yellowish wash over lower belly and undertail, more obvious barring on flanks, thighs and undertail-coverts; iris dark brown; bill blackish; legs olive-brown. Sexes alike, but female crest varies from non-existent through to complete. Juvenile has heavy pale central feather streaks on nape; immature male mostly like adult female, but larger pale tips on primaries, more pointed rectrices, and crest (when present) smaller than adult's; subadult crest remains smaller than that of adult. Voice. Bower-advertisement song, courtship and other calls of male loud and harsh churrings, also vocal avian mimicry (and imitation of human-made sounds). Mimicry of calls of predatory birds given by male at bower and by distressed female at nest in presence of people or other potential predators; foraging birds may mimic. Courtship accompanied by various hissing, crackling and ticking vocalizations.
Habitat. Brigalow (*Acacia*) and eucalypt (*Eucalyptus*) woodlands, with preference for riverine woodland; sea-level to c. 500 m. Traditional bowers sites preferably beneath darker, larger, thorny bushes producing edible fruits; associates with homesteads in interior, where males build bowers in shade of buildings and exotic plants and forage on soft fruits and green vegetables.
Food and Feeding. Primarily fruits, flowers and seeds; also arthropods, including grasshoppers and relatives (Orthoptera), beetles (Coleoptera), ants (Formicidae), spiders (Araneae). Large quantities of fruits and insects (mostly orthopterans) fed to nestlings; large grasshoppers stripped of wings, legs and often also head, before being fed to nestling. Forages mostly in trees and shrubs, occasionally on ground. Forages singly and in small groups, sometimes associating with other birds, e.g. honeyeaters (Meliphagidae); in non-breeding period, forms flocks of 10–30 individuals, and exceptionally of more than 50 birds. Visits gardens, where it feeds on soft fruits and green vegetables.
Breeding. Season prolonged over range, Jul–Mar, peak of egg-laying Oct–Feb; display season Apr–Jan, peak Jul–Nov. Polygynous, promiscuous male building and decorating avenue bower; female builds and attends nest alone. Non-territorial except for defence of bower sites; average inter-bower distance 1–2 km; bower-owning males have larger crest than that of other individuals, and greater crest area proved best predictor of an individual male's status (but crest size did not correlate with mating success among bower-owners). Traditional bower sites can persist for 10–20 years, and individual adult males may remain at a site for 5–6 years or more; two bowers were each built at same site for at least 16 years; bowers rebuilt each season under same bush, on same spot or immediately nearby, or under adjacent bush, and sites of former bowers indicated by accumulations of pebbles or bones remaining long after bower structure disappeared (at one site remains of eight former bowers within 50 m of active one). Bower large, with wide avenue, outside basal walls of sticks and remainder of grass stems, mean dimensions of twelve bowers 48 cm wide and 34 cm high externally, avenue 59 cm long and 20 cm wide, platform extension beyond avenue on average 118 cm (Bullamon Plains, in Queensland), avenues orientated mostly E–W, but variation across range; adult male spends more than 50% of daylight time at bower site; bower decorations (up to c. 2000) vary geographically; include snail shells, bleached bones, water-worn pebbles and many other items, including human-made ones; "painting" of bower by male recorded, and theft of decoration and bower destruction recorded. Courtship involves central and peripheral displays, in former the male standing among decorations adjacent to bower and in latter male posturing while running around bower in wide circles, both involving raising/expanding of lilac crest; four conspicuous central display postures described, Upright, Raised-wings, Sideways Crest-presentation and Forward Crest-presentation, given in any order and accompanied by various vocalizations; two other postures, Rooster Pose and Penguin Pose, performed by a male as he moves away from bower. Nest a bulky, loose foundation of dead twigs and sticks, and egg-cup of fine twiglets, sometimes with dried grass stalks, most built 3–12 m above ground in tree or bush; mean distance of 47 active nests from nearest active bower 400 m; habitual reuse of nest-site or nesting tree over consecutive years not unusual. Clutch 1–3 eggs, mostly 2, possibly laid on alternate days; no information on incubation period; brooding ceases when nestlings 14–15 days old (irrespective of brood size), nestling period at one nest 21 days. Longevity to at least 11–13 years.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally fairly common to scarce. Formerly extended W along Murray R system just into South Australia (where range was always small), but considered now extinct there. Declining in S New South Wales and Victoria; probably nearly extinct in latter state. Reasons for declines thought to include illegal shooting and poisoning, predation by cats and red foxes (*Vulpes vulpes*), and widespread clearance and/or modification and fragmentation of habitat. Members of large flocks attacking fruits and vegetable gardens may be killed, resulting in local declines.
Bibliography. Archer (1926), Baker *et al.* (1999), Barker & Vestjens (1990), Borgia (1995), Borgia & Mueller (1992), Chaffer (1945, 1984), Chaffer & Waterhouse (1987), Chisholm (1929), Donaghey (1996), Emison *et al.*

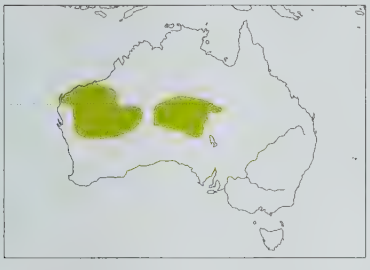
(1987), Ford (1974, 1988), Ford & Parker (1974), Frith, C.B. & Frith (1990f, 1995b, 2001b, 2004), Frith, C.B., Frith & McCullough (1995), Garnett (1992), Gaukrodger (1922), Gilliard (1969), Higgins *et al.* (2006a), Jackson (1912), Madden (2001a, 2002, 2006), Madden & Balmford (2004), Madden *et al.* (2004), Marshall (1952b, 1954, 1956), McCarthy (2006), Miles & Madden (2002), Neville (1988), North (1902), Parker (1979), Richards (1995), Rowland (2008), Schodde & Mason (1999), Walker & Christian (1995), Warham (1962).

19. Western Bowerbird

Chlamydera guttata

French: Jardinier tacheté **German**: Tropfenlaubenvogel **Spanish**: Pergolero Moteado Occidental
Other common names: Spotted Bowerbird(!), Yellow-spotted/Large-spotted/Pale-spotted Bowerbird, Guttated Bowerbird

Taxonomy. *Chlamydera guttata* Gould, 1862, "North-West Australia" = probably upper Fortescue River, Western Australia.
Probably forms a superspecies with *C. maculata*, and in the past considered conspecific. Two subspecies recognized.
Subspecies and Distribution.
C. g. carteri Mathews, 1920 – North West Cape, in Western Australia.
C. g. guttata Gould, 1862 – Western Australia from Eighty Mile Beach S, immediately E of North West Cape, through Pilbara into C interior of state; and from Rawlinson Range E into S Northern Territory (E to c. 200–300 km N & E of Alice Springs), and S to NW South Australia (to c. 100 km S of border).



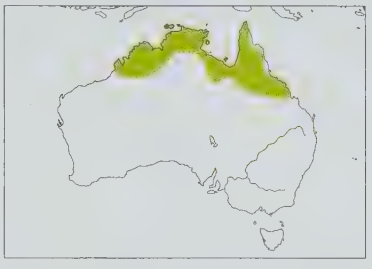
Descriptive notes. 28 cm; male 128–142 g, female 122–148 g. Male nominate race has rufous-buff head and neck with extensive black feather margins and exposed bases, much of crown with glossy silvery-white sheen and feather tipping; large erectile filamentous nuchal crest variably pale to bright pink; upperparts, including upperwing and tail, variably blackish-brown to blackish, paler on wing and tail, with bold terminal and/or subterminal clay-coloured rounded feather spotting, spots paler buff or dirty white on tertials, secondaries, and some primaries and rectrices; fine outer edges of remiges and rectrices pale buff; chin, throat, ear-coverts and upper breast blackish-brown to blackish with bold terminal and/or subterminal clay-coloured spotting, spots becoming browner close to wing; remaining underparts dirty and variably buff, darker on breast and yellower on central belly; side of breast and flanks grading from paler central colour to increasingly rich wash of clay colour; undertail-coverts pale and dilute clay colour, broadly barred olive-brown; iris dark brown; bill blackish; legs olive-brown. Differs from similar *C. maculata* mainly in much darker general appearance, brighter and yellower central region of underparts, stronger silvery sheen on crown. Female is similar to male in plumage, but lacks crest (or acquires smaller one with age), and tail on average slightly longer. Juvenile undescribed; immature male lacks crest, has dorsal spotting creamier and tail on average slightly longer than adult male; subadult male has smaller crest than adult and tail on average slightly longer. Race *carteri* is smaller than nominate, particularly in wing, has shorter nuchal crest, and plumage richer and more russet in colour. Voice. Little known. Male's bower-advertisement song consists of repeated loud and harsh churring calls, probably also with mimicry; mimicry utilized also at other times, e.g. when potential predator present. Repertoire said to be similar to that of *C. maculata*, but few documented descriptions.
Habitat. Riverine woodland, scrub thickets in rocky ranges and gorges, and "break-away areas" with available water; sea-level to 500 m. Visits gardens around human habitations.
Food and Feeding. Fruits, particularly rock figs (*Ficus platypoda*), flowers, buds, nectar, seeds; also animal items, mostly insects. Forages mostly in trees and shrubs; sometimes on ground. Usually solitary, in twos or in small groups of up to about six individuals; occasionally larger flocks of up to c. 15.
Breeding. Season prolonged, Jul–Mar, egg-laying in Jul–Dec, on North West Cape (race *carteri*) breeding in Aug–Sept and nestlings/fledglings Sept–Oct; display season most of year, peak Aug–Dec. Polygynous, promiscuous male building and decorating avenue bower; female builds and attends nest alone. Non-territorial, except for defence of bower site by male; traditional bower sites c. 2 km apart, modified according to availability of suitable bushes under which to build. New bower built at site of previous one(s), several disused bowers often within 1 m of active one, or relocated close by; bower large, with wide avenue, external basal walls of sticks and remainder of grass stems, similar to that of *C. maculata*; mean dimensions of four bowers in Western Australia (between Hamersley Range and Barlee Range) 36 cm long and 16 cm wide externally, avenue 23 cm high, platform extending 48 cm beyond end of bower walls, apparently no particular preference regarding avenue orientation; bower decorations (to 1600 or more) include bone fragments, snail shells, pebbles, green fruits and other items (including human-made ones); "painting" of bower recorded, and bower destruction and theft of decorations probably occur. Courtship little known, but postures include Nape-presentation similar to that of *C. maculata* and *Sericulus chrysocephalus*. Nest a shallow bowl foundation of dead twigs and dry vine tendrils, shallow egg-cup lining of finer twigs, tendrils, casuarina (*Casuarina*) needles, acacia (*Acacia*) phyllodes, and/or dried grass stems, typically 2–6 m above ground in low tree or bush; average distance of two nests from nearest active bower 354 m. Clutch 1–2 eggs, mostly 2; no information on incubation and nestling periods.
Movements. Resident. Some local wandering in response to fruit availability and rainfall.
Status and Conservation. Not globally threatened. Generally uncommon. North West Cape population (race *carteri*), recently estimated to be stable at c. 2000 breeding birds, occupying c. 500 km²; in Australia, listed as "near-threatened". Sometimes adversely influenced by drought conditions; a population around a clay pan deserted it, and an incomplete nest, as water evaporated. Many individuals were, and doubtless still are, killed because of their habit of taking garden fruits and vegetables.
Bibliography. Barker & Vestjens (1990), Binstead (1978), Bradley (1987), Carter (1921), Ford (1974), Ford & Parker (1974), Frith & Frith (1997d, 2001b, 2004), Garnett & Crowley (2000), Higgins *et al.* (2006a), Jarman (1953), Johnstone & Storr (2004), Kolichis (1979), Marshall (1954), North (1902), Robinson (1936), Rowland (2008), Schodde & Mason (1999), Serventy, D.L. & Whittell (1962), Serventy, V. (1955), Shurcliff (1986), Veselovský (1979), Whitlock (1910, 1924).

20. Great Bowerbird

Chlamydera nuchalis

French: Jardinier à nuque rose **German**: Graulaubenvogel **Spanish**: Pergolero Grande
Other common names: Great Grey Bowerbird, Lilac-naped Bowerbird

Taxonomy. *Ptilonorhynchus nuchalis* Jardine and Selby, 1830, Port Darwin district, Northern Territory, Australia.
Hybridization with *C. maculata* recorded SE of Charters Towers (E Queensland). Proposed races *oweni* (described from Point Torment, in N Western Australia) and *yorki* (from Utingu, in extreme N Queensland) synonymized with, respectively, nominate and *orientalis*. Two subspecies recognized.
Subspecies and Distribution.
C. n. nuchalis (Jardine & Selby, 1830) – N Western Australia (Kimberley Division) E, including numerous offshore islands, to N Northern Territory and extreme NW Queensland.
C. n. orientalis Gould, 1879 – Queensland (except extreme NW) S in W to c. 20° S and in E to Clermont and Connors Range (generally absent from humid coast in Cardwell–Tully region and E watershed of wet tropics).



Descriptive notes. 35 cm; male 180–265 g, female 153–215 g. Male nominate race is entirely brownish-grey, slightly darker and greyer on chin, throat, upper chest and upperparts; crown more grey, darker and browner on lores, variably finely spotted with both a darker colour and a silvery colour; erectile filamentous pinkish-mauve nuchal crest; mantle, upperwing, uppertail-coverts and tail feathers basally and centrally variably dark brown, with conspicuous large whitish tips, extensive pale tips on some uppertail-coverts may have several darker bars across them; undertail-coverts paler brownish-grey, each feather with 3–5 bars of darker brownish-grey; iris dark brown; bill blackish; legs olive-brown. Female is similar to male in plumage, but lacks crest (or has only small one), is also smaller (notably in wing length) and less heavy. Juvenile has mantle, back and rump conspicuously spotted with pale buff (as on adult *C. maculata*); immature male lacks crest, has dusky throat, and heavily barred and mottled brown-grey breast; subadult male like adult but with crest incomplete, sometimes traces of flank barring remaining. Race *orientalis* is smaller and darker than nominate, more brownish upperpart markings contrasting more with whitish feather tips, underparts typically paler and more likely to be strongly barred on flanks. Voice. Male's advertisement song, courtship calls and other calls include loud harsh notes, explosive hissing, churring, cackling and chattering, also vocal avian and other mimicry (including human-made sounds); given from regularly used perches atop trees 6–8 m tall, on average 30–200 m from bower (closer during peak display). Mimicry of calls of predatory birds given by male at bower and by female at nest in presence of people or other potential predators; calls of other birds may be opportunistically and temporarily imitated.
Habitat. Eucalypt (*Eucalyptus*) forest and woodland, particularly riverine forest and thicket within it, mangroves, edges of rainforest and of monsoon forest, also suburbs and gardens; usually close to water. Sea-level to c. 600 m. Bowers built beneath bushes with shading canopy, typically close to edge of riverine or other protective vegetation adjacent to open habitat; also in parks and gardens, on footpaths, and even within or (if overhung by foliage) on top of buildings.
Food and Feeding. Fruits, flowers, nectar, green vegetables, animals (mostly insects), seeds, and food scraps; figs (*Ficus*) a major component of fruit diet. Nestlings fed more with animals, mostly large grasshoppers (Acrididae), than with fruits. Bower-owning males cache fruits about bower site for later consumption. Forages mostly in trees, especially fruiting figs, and in shrubs, also on ground. Mainly singly or in twos, sometimes in small groups of 3–6 individuals; in non-breeding period occasionally 20–30 gather in fruiting trees.
Breeding. Recorded in all months except Apr and Jun across range, peak of egg-laying Oct–Nov and nestling presence Oct–Mar; display season May/Jun–Dec/early Jan (from early Feb at some localities), peak activity Jul–Nov. Polygynous, promiscuous male building and decorating avenue bower; females builds and attends nest alone. Non-territorial, except for defence of bower site by male; traditional bower sites c. 1–2 km apart. One bower site used for more than 70 years; bowers rebuilt each season or same structure used over consecutive years; erected under same bush as previous one(s) or beneath another nearby (up to c. 100 m distant) but within same site; several old structures may remain around a bower site for five decades or more. Bower a long, substantial, thick-walled avenue of stout sticks (700–920 sticks in a single bower wall), tops of inwardly curving central inner walls sometimes meeting to form tunnel, platform upon which avenue built substantial; a few bowers may have a third or fourth wall; in Queensland, mean dimensions of 54 bowers 61 cm long, 51 cm wide and 37 cm high externally, avenue 14 cm wide (Townsville), of ten others 51 cm wide and 37 cm long externally, avenue 59 cm long and 15 cm wide (McCleod R); avenue alignment typically N–S or close to that, but some geographical variation; adult male spends more than 50% of daylight time at bower site; bower decorations (as many as 12,000), placed on platform at each avenue entrance, include white or grey land-snail shells and mammal bones, green fruits, leaves, some red or reddish items, and many other items (including human-made ones); "painting" of bower recorded, theft of decorations and bower destruction recorded. Courtship involves peripheral displays (strutting walk or run around bower) and central postures (Upright, Forward-stretch, Crest-presentation) performed at bower entrances; similar to that of *C. maculata*. Nest a loosely built, shallow to deep saucer with foundation of slender sticks and twigs, egg-cup lining of finer twigs and few leaves, built c. 2–9 m above ground mostly in tree, bush or sapling; average distance of six nests from nearest active bower 64 m; habitual reuse of nest-site or nesting tree not unusual. Clutch 1–2 eggs, mostly 1; incubation period at one nest 21 days; brooding ceases when nestlings 14–15 days old (irrespective of brood size), nestling period at one nest 20–21 days; female mimics calls of predators if potential predator approaches, if disturbed may also perform distraction display and/or chase conspecifics from nest area; fledged young fed by parent Feb–Apr, and female foraging on fruits with identical-looking dependent young in Mar.
Movements. Resident.
Status and Conservation. Not globally threatened. Locally common to fairly common. Appears possibly to have declined in S Atherton Tableland area of N Queensland since c.1940. Can cause damage in areas of commercially grown crops; birds attacking soft fruits and green vegetable crops, particularly when in winter flocks, are not uncommonly killed by people.
Bibliography. Baker *et al.* (1999), Barker & Vestjens (1990), Barnard (1914), Blakers *et al.* (1984), Borgia (1995), Breeden & Wright (1989), Frith, C.B. & Frith (1990e, 1995b, 1999b, 2001b, 2004), Frith, C.B., Frith & McCullough (1995), Frith, C.B., Frith & Weineke (1994, 1996), Frith, H.J. & Hitchcock (1974), Gilliard (1969), Higgins *et al.* (2006a), Hopkins (1953, 1974), Marshall (1952a, 1954), Mayr & Jennings (1952), McCarthy (2006), McKenzie *et al.* (1995), North (1902), Rowland (2008), Schodde & Mason (1999), Sedgwick (1946), Shingleton (2005), Thorogood (1941), Veselovský (1978, 1979), Warham (1957, 1962), White (1922), Whitlock (1925).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family PARADISAEIDAE (BIRDS-OF-PARADISE)



- Small to large passerines with stout powerful bill of diverse size and shape, several with long or exceedingly long tail; males typically ornately plumaged.
- 15–44 cm (up to 110 cm, with tail streamers).



- Moluccas, New Guinea and satellites, and north-eastern Australia.
- Rainforest and other dense vegetation, a few also in more open habitats.
- 16 genera, 42 species, 90 taxa.
- 3 species threatened; none extinct since 1600.

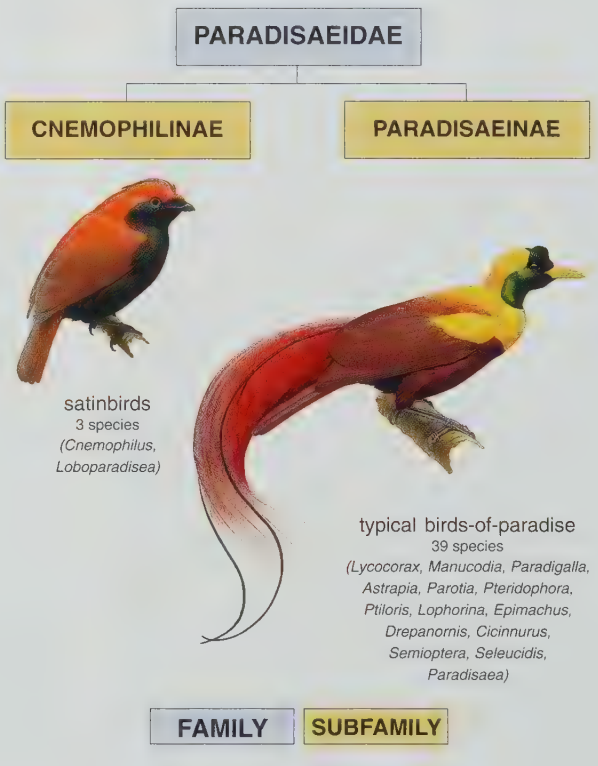
Systematics

For a long time, ornithologists treated the bird-of-paradise family, Paradisaeidae, as closest to the bowerbirds (Ptilonorhynchidae), even after avian anatomists published contrary views. Indeed, some combined the bowerbirds and the birds-of-paradise into a single family, Paradisaeidae. Just as increasing biological evidence for a major dichotomy between the two was acknowledged, results of several biomolecular studies supported the discrete status of Paradisaeidae, which was found to be not only distinct from the bowerbirds but also relatively distant from them. Contemporary research involving hypothetical "molecular clock" calibrations suggests that the separation of the birds-of-paradise and their immediate relatives from the bowerbirds occurred some 28 million years ago, although the validity of such calibrations remains to be seen.

Today, the prevailing view is that the majority, about 85%, of passerine species living in Australia and New Guinea have a southern, Gondwanan, origin. This major group, termed the "parvorder Corvida", comprises three major lineages: these are the superfamilies Menuroidea, Meliphagoidea and Corvoidea. The first of these, Menuroidea, includes the bowerbirds, and the last, Corvoidea, incorporates the birds-of-paradise. As a result of analytical studies based on avian DNA–DNA hybridization, the findings of which were summarized in 1990, Paradisaeidae was seen as the sister-group to the radiation comprising the wood-swallows (Artamidae), the butcherbirds (Cracticidae), the Old World orioles (Oriolidae) and the cuckoo-shrikes (Campephagidae); at the next highest level, the crows and their allies (Corvidae) form the sister-group to this lineage comprised by the paradisaeids, orioles and butcherbirds. A subsequent phylogeny of the passerines, based on two single-copy nuclear-gene sequences, placed Paradisaeidae close to the apex of "core Corvoidea" and among the Australian mudnesters (Struthideidae), monarchines (Monarchidae) and true corvids; in this phylogeny, the birds-of-paradise are far removed from the cnemophilines, which, together with the berrypeckers and longbills (Melanocharitidae) and New Zealand wattlebirds (Callaeidae), form a sister-group to the core Corvoidea.

In addition to the bowerbirds, a number of species or groups, including the Silktail (*Lamprolia victoriae*) of Fiji, the New Zealand wattlebirds, and the Lesser Melampitta (*Melampitta lugubris*) of highland New Guinea, have been mooted to be members of the bird-of-paradise family. Both the Silktail and the wattlebirds are now known to be unrelated to birds-of-paradise, the former currently being placed with the monarch-flycatchers in the Monarchidae, and the latter, as mentioned above, being accorded their own family, Callaeidae. The Lesser Melampitta is presently included with the jewel-babblers and allies in the family Eupetidae, but the results of recent biomolecular studies place it with the Australian monarchines and the corcoracid mudnesters, thus putting it close to Paradisaeidae but not as part of this family.

In the current arrangement, the family Paradisaeidae comprises 42 species in 16 genera. These are distributed primarily in New Guinea and its satellite islands, which have 38 species. Two of these, the Trumpet Manucode (*Manucodia keraudrenii*) and the Magnificent Riflebird (*Ptiloris magnificus*), extend also to extreme north-east Australia, and the two other members of *Ptiloris* are confined to the latter country, being found in the north-eastern to mid-eastern coastal region. The remaining two mem-



Subdivision of the Paradisaeidae

[Figure: Chris Rose]

Two subfamilies may be recognized in Paradisaeidae as constituted herein. The three "wide-gaped" species in the genera Cnemophilus *and* Loboparadisea *make up the subfamily Cnemophilinae, and the "typical" birds-of-paradise, the Paradisaeinae.* ***Loria's Bird-of-paradise****, the Crested Bird-of-paradise* (C. macgregorii) *and the Yellow-breasted Bird-of-paradise* (Loboparadisea sericea) *are conspicuously weak-billed, with weak legs and feet, which they do not use to manipulate food. Some recent taxonomists have accorded them their own family, Cnemophilidae, typically referred to as the "satinbirds".*

[*Cnemophilus loriae*, Ubaigubi, EC New Guinea. Photo: William S. Peckover]

bers of the family, in the monotypic genera *Semioptera* and *Lycocorax*, are restricted to the northern part of the Moluccas. The five species of manucode and the Paradise Crow (*Lycocorax pyrrhopterus*) reproduce as socially monogamous pairs, whereas the remaining 36 species in the family are polygynous, the promiscuous males attracting females to traditional solitary courts, display perches or communal leks, where they court and mate with them (see Breeding).

Since about the middle of the twentieth century, ornithologists had established a remarkable stability with regard to the definition of species limits within the birds-of-paradise. Recently, however, the phylogenetic species concept was applied to the group, resulting in a dramatic increase in the number of constituent species recognized, to about 90. For numerous reasons, the elucidation of which is beyond the scope of the present work, this taxonomic treatment has not received wide acceptance.

Two subfamilies have been recognized in recent decades. The three "wide-gaped" species in the genera *Cnemophilus* and *Loboparadisea* constitute the subfamily Cnemophilinae, and the remaining 14 genera, the "typical" or "true" birds-of-paradise, are united in Paradisaeinae. Unlike the condition in the latter, the skulls of the Cnemophilinae lack nasal ossification, the lacrymal is absent, and the head of the orbital processes of the quadrate is expanded; in addition, the three species are conspicuously weak-billed and weak-footed (see Morphological Aspects). Nevertheless, a number of characters shared by the two subfamilies appeared to support the hypothesis that they merited placement together in the Paradisaeidae, their cranial and mandibular osteology indicating to some authorities that the cnemophilines are a basal sister-group to the main paradisaeine lineage. Increasingly contradicting this perception, however, were a number of observations about the cnemophiline species. First, their small, weak feet appear never to be used as a means of holding items against a perch; secondly, it looks as if the weak bill and the strikingly wide gape are adaptations to an obligate or near-obligate frugivorous diet, in addition to which they build a globular domed nest structure with a side entrance hole, and they have a distinctive juvenile plumage. These are all traits not shared by typical birds-of-paradise. Moreover, recent biomolecular studies indicate that the three wide-gaped species form a quite distinctive group, and that this forms a clade with the New Guinea berrypeckers and longbills and the New Zealand wattlebirds, far removed from the true birds-of-paradise and towards the lower, or basal, oscines, and thus closer to the bowerbirds, with which



Pointing to its affinity with the Cnemophilus *species, the* ***Yellow-breasted Bird-of-paradise*** *is sometimes known as the Yellow-breasted Cnemophilus. A number of characters shared with the Paradisaeinae support the hypothesis that the cnemophilines belong in Paradisaeidae. However, recent biomolecular studies indicate that they are a quite distinctive group, forming a clade with the New Guinea berrypeckers and longbills (Melanocharitidae), and the New Zealand wattlebirds (Callaeidae). Far removed from the true birds-of-paradise, they appear closer to the bowerbirds (Ptilonorhynchidae).*

[*Loboparadisea sericea*, Crater Mountain, EC New Guinea. Photo: William S. Peckover]



the cnemophilines exhibit similarities in some skull characters, than to the "true" birds-of-paradise. Although the cnemophilines are still covered in the present family, there is serious doubt as to whether they really should be seen as members of Paradisaeidae. Indeed, some recent taxonomic lists have accorded them a family of their own, Cnemophilidae, the satinbirds. A 2008 molecular phylogenetic study even found "reasonable support for a Passerida affinity of Callaeatidae [sic] and Cnemophilidae, contrary to previous molecular studies".

The relationships of MacGregor's Honeyeater (*Macgregoria pulchra*) within the Paradisaeidae remained much debated until the publication, in 2000 and later, of a number of biomolecular studies. This was because, as many authorities had reported, this species appeared to exhibit some characteristics of both the Cnemophilinae and the Paradisaeinae. The last significant systematic attempt at a phylogeny of the Paradisaeidae placed the monotypic genus *Macgregoria* basally within the Paradisaeinae, as did several immediately preceding studies. The reason for the long unsettled position of *Macgregoria* is that its morphology, its zoogeography and the little that is known of its biology proved to be completely misleading; biomolecular analyses have now established that this bird is, in fact, a giant, patchily distributed, high-altitude, specialist honeyeater (Meliphagidae). It is noteworthy, in hindsight, that in 1962 the bird was described as "very active, darting into the bushes in honeyeater fashion".

Anatomically, the birds-of-paradise are broadly typical of the oscine passerines, and are generally crow-like, as is reflected in their average size, shape, strength, demeanour, powerful appendages, and vocalizations. Features typical of the paradisaeine skull include a small or non-existent lacrymal and, consequently, a large ectethmoid plate solidly fused with the frontal bone and a short orbital process of the quadrate with an expanded distal tip. The family is morphologically and behaviourally extremely diverse, but the following combination of characters, not all of which are shown by the three cnemophilines, helps to define them. The hatchlings lack down and have dark to black skin, and the chicks are fed by regurgitation. The adult male plumage includes strong iridescence, and the species display a range of extremely bright plumages not otherwise found among the corvoid assemblage; plumage maturation of males is greatly delayed. The body is compact and powerful, the bill is diverse but stout and strong, and the feet are large and powerful, like those of a crow, the feet being employed for holding and manipulating food items. Open-bill probing is one of the feeding methods used by these birds, which move mostly by hopping but also have the ability to walk. They



Within the typical birds-of-paradise, the subfamily Paradisaeinae, are two well-defined lineages. One comprises the manucodes in the genus Manucodia *along with the* ***Paradise Crow*** *in the monotypic genus* Lycocorax. *Together these genera may constitute a valid subfamily: unlike most of the other Paradisaeidae, all are socially monogamous, and sexually monomorphic, both sexes being basically all black, with degrees of blue and/or green iridescence. They are mostly quite large for paradisaeids, and are generally longer-winged than one would expect in relation to their mass.*

[*Lycocorax pyrrhopterus*, Halmahera, Moluccas. Photo: Tim Laman]

have a distinctive flap-and-glide undulating flight, in addition to which the wings of adult males in many genera produce a characteristic sound during flapping flight. The birds-of-paradise construct nests not from sticks, but, instead, use supple long stems of epiphytic orchids and vines; they lay attractively coloured eggs typically decorated with darker broad elongate brush-like strokes. They are predominantly polygynous, the promiscuous males persistently vocal at traditional display leks, courts or perches, and the females take sole responsibility for the rearing of the chicks.

Almost every publication reviewing the Paradisaeidae has presented a listing, or a phylogeny, of the family, with assessment of the differences, ranging from gross to subtle, in the perceived relationships among the genera. A study in the mid-1990s provided a first partial phylogeny of the birds-of-paradise based on base-pair sequences of mitochondrial DNA, but the researchers in this case lacked material of the Cnemophilinae and of the genera *Paradigalla*, *Astrapia*, *Pteridophora* and *Semioptera*. The findings of this study placed the manucodes, then the genus *Parotia* and then the sicklebills (*Epimachus* and *Drepanornis*) basally within the Paradisaeinae; separated the sicklebills into two lineages; treated *Paradisaea* as a lineage basal to a clade including *Cicinnurus*, *Seleucidis* and *Ptiloris*; and treated *Ptiloris* and *Lophorina* as sister lineages.

Within the typical birds-of-paradise, the subfamily Paradisaeinae, are two well-defined lineages. One of these comprises the manucodes in the genus *Manucodia* along with the Paradise Crow in *Lycocorax*, and the other contains the 26 species known as "plumed paradisaeine birds"; the latter are discussed below. Lineages of less certain affinity are *Paradigalla* and *Astrapia*; the former appears basal, whereas *Astrapia* is considered the sister-group to the plumed birds and in terms of its morphology is arguably a member of them. The lineage with the manucodes and Paradise Crow is distinctive, possibly constituting a valid subfamily, and is well defined by a range of characters but especially by plumage and tracheal morphology. Recent biomolecular studies indicate that the manucodes and the plumed paradisaeine lineages may have diverged about 20–18 million to as recently as about 7 million years ago. The geographical distributions of these two lineages are the same in that they extend from the Moluccas southeastwards to the humid forests of eastern Australia.

The two paradigallas form a lineage of obscure affinities, particularly as they remain little known. Their nesting habits are like those of typical paradisaeine birds-of-paradise, but the black plumage of both sexes and the egg morphology link them to basal taxa such as *Manucodia*. In terms of habit, plumage, and body and bill morphology, however, *Paradigalla* appears closest to *Astrapia*. The predominantly black plumage of the two sexes, both of which also are long-tailed, links *Astrapia* to the basal Paradisaeinae taxa, but the male's ornate erectile head and mantle feathering, the ventral barring of females, and the egg morphology ally this genus to the plumed lineage. The 26 plumed species appear to have resulted from a single radiation. They can be divided into four clades, well defined by morphology: these are the "flagbirds" (*Pteridophora*, *Parotia*), the riflebirds (*Ptiloris*, *Lophorina*), the sicklebills (*Epimachus*, *Drepanornis*), and the "sickletails" (*Cicinnurus*) together with the typical plumed species (*Semioptera*, *Seleucidis*, *Paradisaea*). Males of the two flagbird genera have velvety black dorsal plumage, erectile occipital plumes, a small iridescent throat patch, and distinctive courtship displays. Male riflebirds, suggested as having diverged



With its crown feathering distinctively curled, in addition to its distinctive neck feathers, the ***Crinkle-collared Manucode*** *may form a superspecies with the largest of the paradisaeids, the Curl-crested Manucode* (Manucodia comrii). *The altitudinally limited distribution of different forest habitats dictates the distributions of the various species. The Crinkle-collared Manucode is adapted to upland forest and the Jobi Manucode* (M. jobiensis) *to lowland forest, with extensive geographical overlap but little or no sharing of specific habitat.*

[*Manucodia chalybatus*, near Brown River, SE New Guinea. Photo: Brian J. Coates]

from other paradisaeines about 4 million years ago, all possess a distinctive metallic-looking breast shield, display on a log or stump, and have similar typical advertisement song and static display posturing. Flagbirds and riflebirds have been linked, as sister forms, to a larger assemblage in which the sicklebills are located as a sister-group to a grouping that includes the *Paradisaea* clade (*Cicinnurus*, *Seleucidis*, *Semioptera*, *Paradisaea*).

While the group of four sicklebills is defined by the possession of a long, sickle-shaped bill, the erectile pectoral plumes of the males, and the mantle and upperwing colouring of the females, the four species do, in fact, form two closely related but distinct lineages. The two *Epimachus* "sabretail" sicklebills are defined by marked sexual dimorphism, a grossly elongate and pointed tail, a brightly coloured iris, an iridescent mantle and crown in adult males and an unbarred chin and throat in both sexes. In contrast, the two *Drepanornis* sicklebills have far less marked sexual dimorphism, a much shorter and rounded tail, bare facial skin, a brown iris, no iridescence on the mantle and crown, and a barred chin and throat in females and immature males. In addition, *Drepanornis* shares several traits with *Cicinnurus* that *Epimachus* does not.

The fourth and final clade of plumed species contains several sublineages and is the most complex. Its constituent genera, *Cicinnurus*, *Semioptera*, *Seleucidis* and *Paradisaea*, are linked by several shared characters, including iridescent green and brilliant red and/or yellow areas of feathering in the adult male nuptial plumage, *Paradisaea*-type advertisement vocalizations and display postures, and an absence of or limited extent of black in the adult male plumage. Within this clade, adult males of the three diminutive *Cicinnurus* sickletails have the central pair of rectrices modified into recurved "wires", and exhibit iridescent green ventral plumage, red dorsal plumes, and bright blue legs and feet. The genus *Paradisaea* is defined by the presence of both filamentous elongated flank plumes and grossly elongated wire-like or tape-like central rectrices in adult males. As a matter of fact, although commonly termed "flank plumes", the elongated plumes arise from beneath the wing and are strictly, therefore, pectoral plumes. This genus contains the seven "true" plumed bird-of-paradise species, namely the Lesser Bird-of-paradise (*Paradisaea minor*), Greater Bird-of-paradise (*Paradisaea apoda*), Raggiana Bird-of-paradise (*Paradisaea raggiana*), Goldie's Bird-of-paradise (*Paradisaea decora*), Red Bird-of-paradise (*Paradisaea rubra*), Emperor Bird-of-paradise (*Paradisaea guilielmi*) and Blue Bird-of-paradise (*Paradisaea rudolphi*). The last three of these are the least typical or the most aberrant.

Completing the "*Paradisaea* clade" are the two monotypic genera *Semioptera* and *Seleucidis*. The Standardwing Bird-of-paradise (*Semioptera wallacii*), an aberrant member of the family restricted to the Moluccas, appears to be a sister form of the sickletail–*Paradisaea* group, a theory supported by its green adult male ventral plumage and the fact that the sickletails and *Paradisaea* are geographically the closest higher paradisaeines. Although the Twelve-wired Bird-of-paradise (*Seleucidis melanoleucus*) is less aberrant, a full resolution of its affinities is complicated by the fact that it exhibits two character suites. One of these (including black adult male plumage, its female plumage, bill morphology, and tree-stump display sites) links it to the riflebirds and the other (including filamentous yellow flank plumes, *Paradisaea*-type advertisement vocalizations and displays, and pale leg and iris colours) to the *Paradisaea* lineage. It has been suggested that the latter characters are derived and the former primitive, and thus of less taxonomic significance.

Hybridization is a well-documented feature of this family. Thirteen intergeneric hybrid crosses and seven intrageneric crosses are known in the wild, their existence emphasizing the close genetic relationships between the paradisaeine species, despite extreme morphological differences between the adult males of the genera and species concerned. Only polygynous species are implicated in hybridization in the wild, but there is a contemporary instance of a male Trumpet Manucode and a female Crinkle-collared Manucode (*Manucodia chalybatus*) interbreeding in captivity. The phenomenon of hybridization within this family is not surprising given that the promiscuous males of polygynous species show no discrimination in mate choice, but will readily mount almost any female-looking bird that visits their display sites. Presumably, young and naive female birds-of-paradise sometimes mate with males of another species in error, and any female may do so if conspecific mates are not available, as, for example, at the geographical or elevational limits of the species' distribution.

Finally, it must be noted that the correct spelling of the genus *Paradisaea*, the type genus of the family, has recently been the subject of considerable discussion (see page 46).

Morphological Aspects

The cnemophilines do share some traits with typical birds-of-paradise, examples being the egg and nestling characters, the feeding of the young by regurgitation, nest materials, the female's



Brightly coloured bare skin is confined to adult males in most birds-of-paradise, but both male and female ***Short-tailed Paradigallas*** *have the large bright yellow wattle on the foreface, and a less conspicuous sky-blue wattle at the base of the lower mandible. The sexes are generally alike in both paradigalla species, although females are slightly smaller and duller. The nesting habits of paradigallas are like those of the most typical birds-of-paradise, but the black plumage of both sexes, and the egg morphology, link them to basal taxa such as* Manucodia, *although unlike the manucodes and like most of the other paradisaeids, they are polygynous.*

[*Paradigalla brevicauda*, Tari Gap, EC New Guinea. Photo: Nick Athanas]



In many bird-of-paradise the adult males have their plumage highly modified for nuptial display, particularly the central pair of rectrices. In the ***Ribbon-tailed Astrapia*** *this pair of feathers is grossly elongated into two cotton-white "ribbons", 2 cm wide, which can be more than a metre in length in some individuals. The terminal quarter of the shaft of each feather is blackish, and 3–4 cm at the tip are blackish-brown. The average length of male birds is 32 cm to the end of the sharply pointed, graduated tail, or 125 cm when the central rectrices are included. With increasing age, the central rectrices become progressively longer as the other rectrices become progressively shorter. One male Ribbon-tailed Astrapia in captivity took at least six years to acquire full adult plumage, and studies of a number of polygynous, sexually dimorphic species show that males take at least five to seven years to acquire their full adult dress. Female Ribbon-tailed Astrapias are smaller than males, at 53 cm, including their much less elongated central rectrices; there is no overlap between the sexes in the lengths of wings and tails. The predominantly black plumage of both sexes, and the fact that both are long-tailed, link* Astrapia *to the basal Paradisaeinae taxa such as* Manucodia*; but the male's ornate erectile head and mantle feathering, the ventral barring of the females, and the egg morphology all ally this genus to the plumed lineage. The Ribbon-tailed Astrapia is a bird of upper montane and subalpine moss forests in the New Guinea Highlands, mostly above 2450 m. Where it overlaps with Stephanie's Astrapia* (A. stephaniae)*, which ranges from middle to upper montane forest, hybridization can occur.*

[*Astrapia mayeri*,
Mount Hagen,
EC New Guinea.
Photo: Brian J. Coates]



While the males display, the females choose amongst them—and later, in the polygynous species, incubate the eggs and raise the chicks alone. This may partly explain why females of the vast majority of the polygynous species are cryptically coloured in subdued browns and dull yellows. This ***Huon Astrapia*** *shows the characteristic ventral barring of female astrapias. Female parasaeids develop their adult appearance within a year of fledging. Immature males are identical in plumage to the adult females, or at least so similar that they cannot be sexed by outward appearance alone.*

[*Astrapia rothschildi*, Huon Peninsula, New Guinea. Photo: Tim Laman]

wing coloration, the specialized mouth colouring and contour feathers of the adult males, evidence of delayed plumage maturation among males, polygynous reproduction with courtship at traditional perches by promiscuous males, and paradisaeine-like vocal advertisement. In bill and leg morphology, however, the two groups are entirely different. In marked contrast to the narrow or stout but powerful bills of the typical birds-of-paradise, adapted to a diverse omnivorous diet, the cnemophilines have a small, fine-tipped, weak bill with an exceptionally wide gape, as adaptations to an exclusively fruit-based diet consisting largely of simple drupes. Similarly, in contrast to the powerful and crow-like legs and feet of the former group, the cnemophilines have fine, weak legs and feet, which they do not use for manipulating food items. The cnemophiline genera are, as a group, typically shorter-winged than the other genera of the family (see also Systematics).

Size varies greatly within the family, ranging from a total length of 15 cm and a body weight of 50 g, as for the King Bird-of-paradise (*Cicinnurus regius*), to a basic length of 44 cm and a weight of 450 g for the Curl-crested Manucode (*Manucodia comrii*). The adult male Black Sicklebill (*Epimachus fastosus*), if its long sabre-like tail feathers are included in the measurement, reaches 110 cm in total length. Males are larger and heavier than females except in the case of the Yellow-breasted Bird-of-paradise (*Loboparadisea sericea*), the females of which are the slightly larger and heavier of the two sexes. The male-to-female weight ratios vary considerably, from as low as 0·87 for the Yellow-breasted Bird-of-paradise to as high as 1·56 for the Raggiana Bird-of-paradise. Juvenile and immature individuals are generally smaller than the subadults and adults of the same species. The male is the sex that displays, and the female is the one that chooses. Courtship display will almost certainly be more impressive to females if performed by a larger individual male. The Yellow-breasted Bird-of-paradise, however, provides a curious exception in exhibiting a reversal of the normal situation with regard to sexual size dimorphism.

The bills of the various genera vary from being short to being long, from slim to stout, and from straight to strongly decurved, reflecting strong adaptive radiation. Many taxa, such as, for example, the genera *Paradigalla*, *Astrapia* and *Cicinnurus*, exhibit a small slim bill. Figures for the mean adult female bill length and width as a percentage of those of adult males reveal that, in general, the bills of adult males are on average about 5% larger than those of adult females. Relative sexual dimorphism in bill size is, with a few notable exceptions, typically constant within a genus or among the species of closely related genera; examples can be found by comparing the sexes of *Lycocorax* and *Manucodia*, or those of *Paradigalla*, *Parotia* and *Pteridophora*, or those of *Cicinnurus* and *Paradisaea*. Within the subfamily Paradisaeinae, sexual dimorphism in bill size is most diverse among the riflebirds. Males of the Magnificent Riflebird have the longer bill, a situation which is typical of the family as a whole, whereas in the other two riflebird species it is the females that have the longer bill, a case of reversed dimorphism. This latter phenomenon is apparent also, to a lesser degree, with Buff-tailed Sicklebills (*Drepanornis albertisi*). All of the species showing reversed dimorphism in bill size excavate in dead wood, tree crevices and bark, a specialized foraging method that is closely correlated to marked sexual bill-size dimorphism in a few other bird families, notably some woodpeckers (Picidae). In the genera *Lycocorax*, *Manucodia*, *Ptiloris*, *Epimachus* and *Paradisaea*, female bills are on average narrower than those of the males, whereas they are on average slightly broader than those of males in *Paradigalla*, *Astrapia*, *Parotia*, *Pteridophora*, *Lophorina*, *Drepanornis*, *Cicinnurus* and *Seleucidis*.

In most paradisaeid genera, the wings are rounded and, on adult males of several, some of the outer primaries are modified in shape, probably to produce mechanical sound. The mean wing length of most adult females is on average 85–95% that of the males of the species; exceptions include the wide-gaped, cnemophiline species, for which the corresponding figure is 96–102%, the manucodes, with 95–97%, the Splendid Astrapia (*Astrapia splendidissima*), for which it is 99%, the small *Drepanornis* sicklebills, at 97%, and the sickletails, at 96–99%. Sexual size dimorphism as expressed by female wing length as a proportion of the male wing length is greatest in Magnificent Riflebirds, for which the proportion is 81%, Greater and Lesser Birds-of-paradise, with figures of, respectively, 83% and 85%, and the large *Epimachus* sicklebills, the female wing of which is 85–86% the length of the male wing. Sexual dimorphism in body size tends to be reduced in the smaller species of polytypic genera, as found with the paradigallas, the astrapias, the sicklebills, the riflebirds, the sickletails and, particularly, the seven



All the parotias have the alternative name "six-wired bird-of-paradise", after the three long, erectile, wire-like occipital plumes with small spatulate tips, which emerge from the ear-tufts behind each eye. ***Carola's Parotia*** *also has a short, erectile blackish-bronzed frontal crest, tipped silver-white. The top of the skull of Lawes's Parotia* (Parotia lawesii) *is conspicuously "dished", apparently to accommodate the large muscles required to manipulate the six occipital plumes. Similar cranial modifications are found in the rest of the parotias, and in the other "flagbird" species, the King of Saxony Bird-of-paradise* (Pteridophora alberti). *The crown of Carola's Parotia is covered with iridescent coppery-gold feathering and is slightly concave. Adult males of both the Magnificent* (Cicinnurus magnificus) *and the Superb Birds-of-paradise* (Lophorina superba) *have an extensive cape of elongated feathers, originating from the lower nape; this cape is elevated and held against the back of the head in display, and the rear part of the skull is abruptly square-ended to accommodate it. Although smaller, and having rather drab plumage which lacks the head plumes and iridescence, the female Carola's Parotia, as in other paradisaeids, has a longer tail than the male. The iris is sulphur-yellow in the adult male, and pale grey or cream to yellow in the female, this colour difference in the female possibly being age-related. The iris of Lawes's Parotia, which overlaps geographically with Carola's, is distinctly different, being cobalt-blue with a narrow cream-yellow outer ring. The plumage of immature male birds-of-paradise is very similar to that of the adult female, including the longer tail, which decreases in length with age. During successive moults, adult male plumage begins to appear a few feathers at a time, initially on the head.*

[*Parotia carolae*,
Jimi Valley,
EC New Guinea.
Photo: William S. Peckover]

Paradisaea species. It is notable that the Blue Bird-of-paradise, the only non-lekking *Paradisaea* species, not only is the least sexually dimorphic in size, as well as in appearance, but also is overall the smallest member of its genus.

Within the Paradisaeinae, the manucodes and the Paradise Crow are generally longer-winged than one would expect in relation to their mass. The astrapias and the riflebirds tend, on average, to have proportionately shorter wings, the parotias (*Parotia*) are of average wing length, and the King of Saxony Bird-of-paradise (*Pteridophora alberti*), the Superb Bird-of-paradise (*Lophorina superba*) and the sickletails (*Cicinnurus*) are relatively short-winged. Not surprisingly, some island-isolated species, such as the Curl-crested Manucode, have wings proportionately shorter in relation to their weight than those of their mainland relatives. The length of the tarsus as a proportion of the wing length is 21–29% for most members of the family, but is longer in the genus *Parotia*, at 31–32%, and in the cnemophilines, at 33–36%.

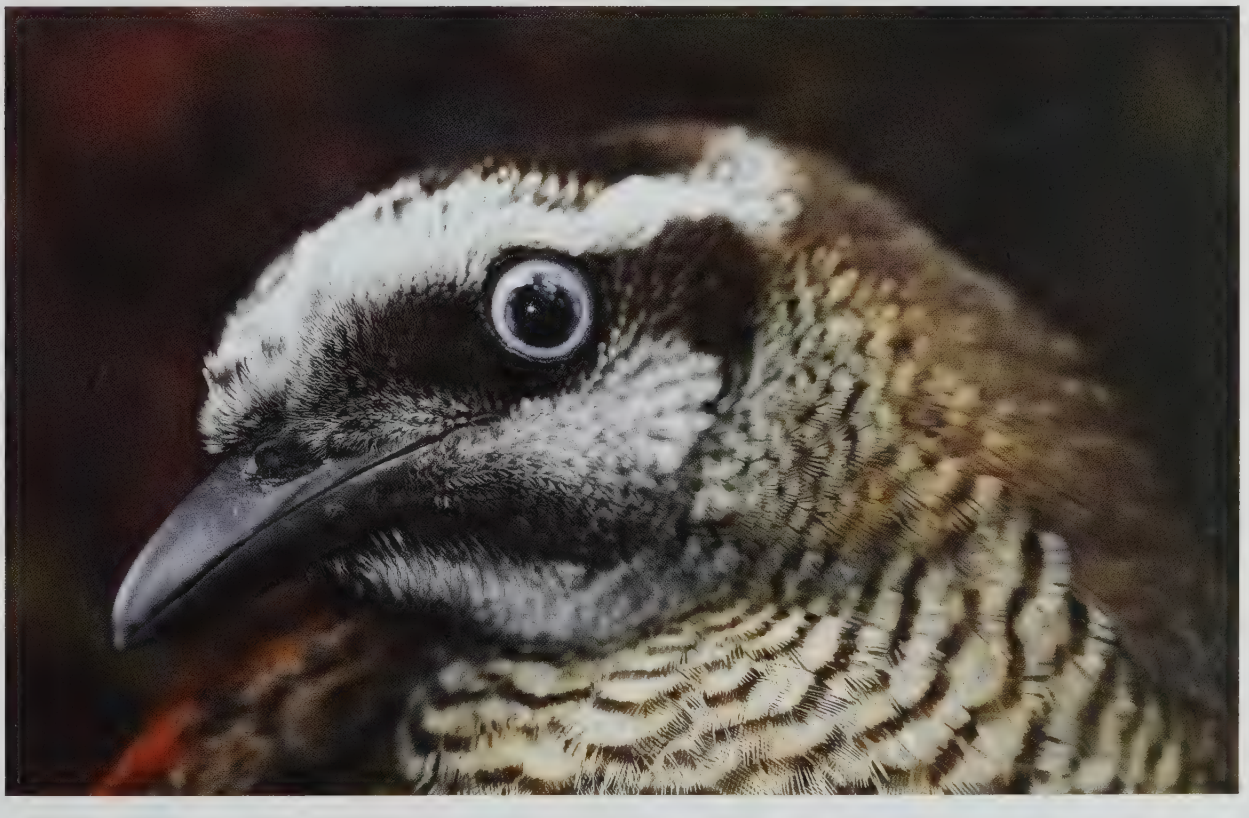
Birds-of-paradise are typical passerines in having ten primaries, the outermost of which is fairly well developed, ten to twelve secondaries and twelve rectrices. The adult males of many of the species have the plumage highly modified for nuptial display, particularly so with the central pair of rectrices, which may become significantly longer or shorter and ornate with increasing age. While most of the species have forward-pointing feathering over the nostrils, a feature also of the corvids, a few have stiff rictal bristles. The erectile head plumes of *Parotia* and *Pteridophora* are associated with cranial modifications that facilitate the large muscles required to manipulate them in display. Adult males of both the Magnificent (*Cicinnurus magnificus*) and the Superb Birds-of-paradise wear an extensive cape of elongated feathers, originating from the lower nape; this cape is elevated and held against the back of the head in display, and the posterior skull is abruptly square-ended to accommodate this. Similarly, the top of the skull of Lawes's Parotia (*Parotia lawesii*) is conspicuously "dished", apparently to accommodate the large muscles required to manipulate the six occipital plumes sported by this species.

The five manucodes and the Paradise Crow, all of which are socially monogamous, and the two paradigallas, which are polygynous, are sexually monomorphic, both sexes being basically all black with degrees of blue and/or green iridescence. The remaining 31 members of the Paradisaeidae are extremely sexually dimorphic, the adult males being adorned with colourful and elaborate plumage. Few other avian families exhibit such diversity of feather form, structure and colour. Some modified feathers of the adult male plumage are not displayed in courtship, but appear to be utilized for the production of sound or to support or strengthen other feathering that is presented in display (see Breeding). An ephemeral yellow pigment, possibly derived from certain foods, which colours the plumes of living adult male Twelve-wired Birds-of-paradise rapidly fades in captivity or in museum specimens. In an examination of more than 6000 bird-of-paradise museum specimens, fewer than 1% were found to show any sign of aberrant plumage, this mostly in the form of partial albinism.

Aside from their elaborated plumage, adult males of many of the species have bright colouring of the legs, eyes, or facial, narial or gape wattles, and brightly coloured bare skin on the face or crown or on the inside of the the mouth. Loria's Bird-of-paradise (*Cnemophilus loriae*) has small gape-flanges, while the Yellow-breasted Bird-of-paradise possesses bulbous narial wattles, which, because they are peculiar to adult males, are probably the result of sexual selection. In contrast, the facial wattles of the paradigallas are present on both sexes, and in this case, therefore, they may play a part in species recognition. Moreover, and uniquely within the family, the thighs of adult male Twelve-wired Birds-of-paradise are bare and deep coral-pink in colour, as are the legs, and they are featured in courtship.

Iris colour varies, probably because it is an important signal distinguishing species, sex and age. With most members of the family, the adults of both sexes have the same iris colour, the exception being the Black Sicklebill, the iris of which is red in adult males and brown in females and immature males. The two parotia species that overlap geographically, namely Lawes's and Carola's Parotias (*Parotia carolae*), have distinctly different iris colours. The bill is typically blackish or black in both sexes, with a few striking exceptions; both sexes of the Magnificent Bird-of-paradise have a pale blue bill and legs, and both sexes of the *Paradisaea* species have the bill pale bluish-grey or yellowish. Pale or colourful legs are possessed only by the sickletails, the Standardwing and Twelve-wired Birds-of-paradise, and most *Paradisaea* species.

The trachea of some manucode species is remarkably modified, for sound production, in being greatly elongated, coiled, and displaced to sit subcutaneously on the pectoral muscles. These



*The **Foja Parotia** differs from Carola's Parotia* (Parotia carolae) *in having a blue, rather than a yellow, iris, and a slightly shorter bill, with the upper mandible more decurved. These two taxa were until recently considered conspecific, but are now treated as forming a superspecies. The bills of the various paradisaeid genera vary from short to long, from slim to stout, and from straight to strongly decurved, reflecting strong adaptive radiation. The bills of adult males average about 5% larger than those of adult females. In the genera* Parotia, Paradigalla, Astrapia, Pteridophora, Lophorina, Drepanornis, Cicinnurus *and* Seleucidis, *the bills of females average slightly broader than those of males; in other genera, they are narrower.*

[*Parotia berlepschi*, Foja Mountains, New Guinea. Photo: Bruce Beehler]



Within the subfamily Paradisaeinae, sexual dimorphism in bill size is most marked among the riflebirds (Ptiloris). *Males of the* ***Magnificent Riflebird*** *have the longer bill, which is typical of the family as a whole, but in the other two species it is the females that have the longer bill, a case of reversed dimorphism. To a lesser degree, this is also the case with Buff-tailed Sicklebills* (Drepanornis albertisi). *All these species excavate in dead wood, tree crevices and bark, a specialized foraging method that is closely correlated to marked sexual bill-size dimorphism in other bird families. In most paradisaeids, female mean wing length averages 85–95% of that of males, with the greatest difference in the Magnificent Riflebird, where the proportion is only 81%. Male riflebirds all possess a distinctive metallic-looking breast shield. In the Magnificent Riflebird this takes the form of a delta-shaped shield of scale-like, intensely iridescent greenish-blue feathers, which in certain lights appears washed with violet-purple and magenta sheens. The lower shield edge is bordered by a narrow band of velvety jet-black feathers with a violet-purple sheen. Below this is an even narrower band of iridescent bronzed yellow-green. The range of the Magnificent Riflebird extends from New Guinea to north-east Australia, whereas the other two riflebird species are found in the north-eastern to mid-eastern coastal region of Australia. The three races of the Magnificent Riflebird differ only minimally, mainly in biometrics such as a more curved or shorter bill. However, they differ in the advertisement vocalizations of their respective males. The distinctive guttural vocalizations of the eastern New Guinea race,* intercedens, *have gained it the alternative name of "Growling Riflebird".*

[*Ptiloris magnificus.* Photo: Alain Compost/Bios]



The sole species in the genus Lophorina, *the* ***Superb Bird-of-paradise*** *forms a clade with the* Ptiloris *riflebirds. Like them, it has throat feathers that are scale-like and greatly elongated laterally, forming a shallow, "winged" delta-shaped shield of intensely iridescent metallic greenish-blue. Its nape feathers are also greatly elongated and modified to form a large, erectile nuchal "cape". The female is markedly smaller than the male, and is similar in appearance to the females of the Magnificent Riflebird* (P. magnificus) *and of the Western* (Parotia sefilata) *and Carola's Parotias* (P. carolae). *The Superb Bird-of-paradise is known to interbreed with all three of these species, along with species from three other genera.*

[*Lophorina superba*, EC New Guinea. Photo: Brian J. Coates]

tracheal modifications are thought to enhance the distance-carrying capacity of calls by significantly lowering their pitch. This is a phenomenon unique among passerines, although similar adaptations can be found in a variety of non-passerines. It may take a minimum of five years for an individual manucode to develop each complete tracheal loop, but this requires confirmation. Tracheal coiling increases with age, is more greatly developed in males than in females, and is correlated with distinct differences between the sexes in vocalizations. The trachea of adult male Twelve-wired Birds-of-paradise, too, is modified, again in a unique way and with little doubt as a means of enhancing advertisement vocalizations, but in a much less dramatic way than with the manucodes.

Studies of a few polygynous, sexually dimorphic species show that the plumage characters of adult males develop over several years, the males taking at least 5–7 years to acquire their full adult dress. This gradual development to full adult nuptial plumage, over a period which is, for a passerine, greatly protracted, provides strong evidence for longevity among these species, some individuals of which certainly do live for a long time. For example, several species are known to have lived for more than 15 years in the wild, and in captivity a 33-year-old male Raggiana Bird-of-paradise successfully fertilized a 13-year-old female, two offspring being reared. Females develop their adult appearance within a year of fledging, and limited evidence suggests that they may commence breeding when as young as a year or two. Females of the vast majority of the polygynous species are drably coloured in subdued browns and dull yellows, or are brown and/or rufous above and dully paler and barred below, to give an overall cryptic appearance. Immature males are identical in plumage to the adult females, or are so similar to the latter that they cannot be sexed on the basis of outward appearance alone. In the year before attaining full adult male plumage, at least some individuals wear an intermediate or subadult plumage; this ranges from just a few feathers of the adult plumage intruding into the otherwise female-like plumage to almost full adult plumage with a few remaining feathers of the female-like plumage, the latter being indicative of an individual that will almost certainly acquire full adult dress later in its present moult or with its next one. This remarkably long period of years spent in cryptic female-like plumage may be a response to severe competition among promiscuous males for access to females. If so, it certainly would be advantageous for young males to be less conspicuous to predators, by retaining cryptic plumage, until reaching maturity. It has also been suggested that this scenario, in which the sexes are heterochronous in acquiring full adult plumage, might in fact reflect an evolutionary strategy that permits young males to approach adult males, to visit their traditional courting sites, and perhaps even to impregnate some of their female visitors, under the "false colours" of female plumage.

Heterochrony refers to temporally unequal development of the sexes within a species, and is broadly described above with regard to birds-of-paradise. Taking the genus *Paradisaea* as a specific example, the males first assume female plumage and fun-

The sicklebills are defined by the possession of a long, curved bill, the erectile pectoral plumes of the males, and the mantle and upperwing colouring of the females. However, the four species form two closely related but distinct lineages. The two Epimachus *"sabretails", the* ***Brown Sicklebill*** *and the Black Sicklebill* (E. fastosus) *are distinguished by marked sexual dimorphism; a greatly elongated tail; a brightly coloured iris; an iridescent mantle and crown in adult males; and an unbarred chin and throat in both sexes. If their elongated central rectrices are included, adult male Brown and Black Sicklebills reach 110 cm in length.*

[*Epimachus meyeri bloodi*, Mount Hagen, EC New Guinea. Photo: Phil Gregory]



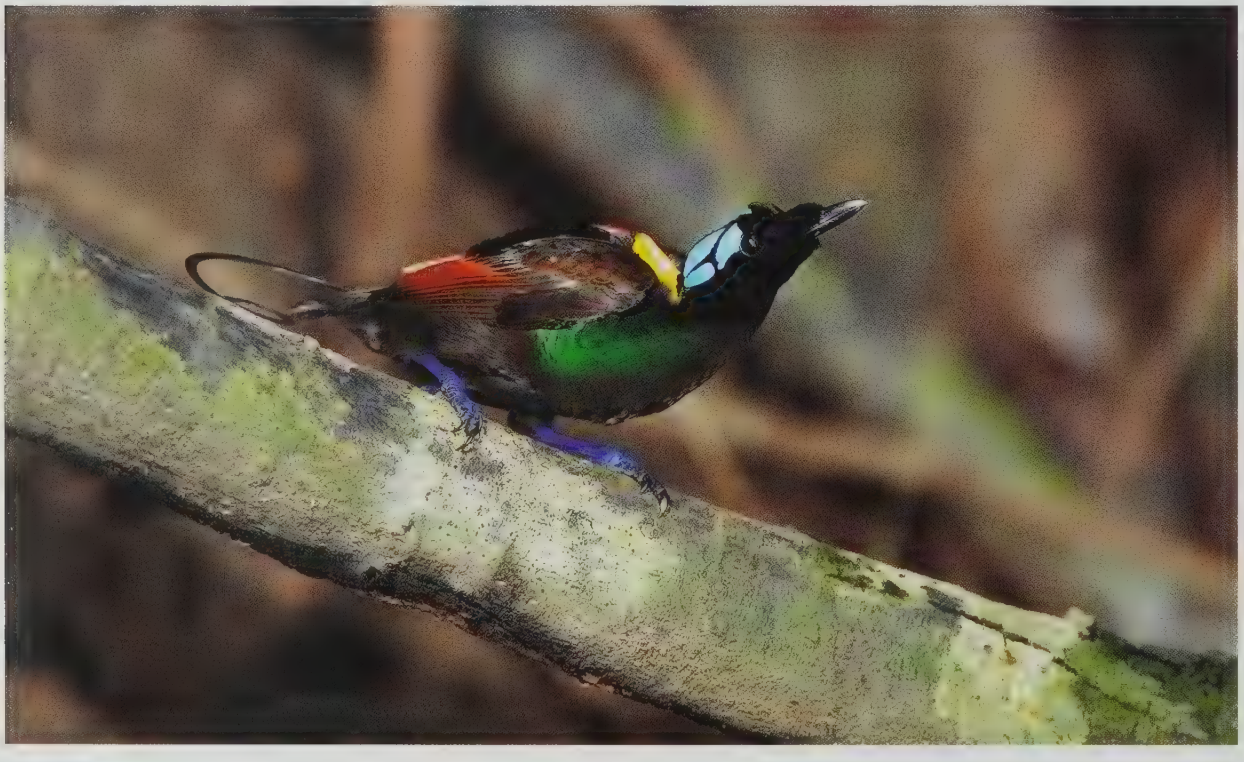


In comparison to the genus Epimachus, *the two* Drepanornis *sicklebills show far less marked sexual dimorphism. The female* ***Buff-tailed Sicklebill*** *is similar to the male in size and weight, and, although lacking the male's iridescent feathering, is otherwise similar above. However, female* Drepanornis *sicklebills differ from males in having the underparts barred with dark brown or blackish-brown.* Drepanornis *species also differ from* Epimachus *in having much shorter, rounded tails, bare facial skin, a brown iris, and no iridescence on the mantle and crown.*

[*Drepanornis albertisi*, Crater Mountain, EC New Guinea. Photo: William S. Peckover]

damentally retain that appearance for up to six or seven years. The first discernible indication that an individual is a male, however, is when an annual moult produces central rectrices longer than the rest of the tail feathers and typically with paddle-shaped tips, together with some green throat feathers and some yellow crown feathering. Increasingly wire-like central rectrices then appear with subsequent moults, in which the young male also acquires a densely feathered, darker breast "cushion" and short flank plumes. With each subsequent year the flank plumes are longer, until finally reaching adult proportions, but even then both they and the central tail wires continue to grow slightly longer with the passing years. Thus, these plumage traits probably signal to conspecifics the age, and therefore the survival ability or fitness, of individual male birds-of-paradise. The primaries are moulted progressively from the innermost outwards, and the rectrices from the central pair outwards (centrifugally). The moult of the tail and body starts at about the time when the renewing of the primaries begins.

Typical birds-of-paradise do not have a distinctive, visually discernible, juvenile plumage, whereas the cnemophilines do. The two members of the genus *Cnemophilus*, namely Loria's Bird-of-paradise and the Crested Bird-of-paradise (*Cnemophilus*



Adult males of the three diminutive Cicinnurus *sickletails have the central pair of rectrices modified into recurved "wires". They have iridescent green ventral plumage, red dorsal plumes, and bright blue legs and feet. The male* ***Wilson's Bird-of-paradise*** *has a largely unfeathered crown and nape, the bright blue exposed skin criss-crossed with lines of fine, velvety black feathering. The female is similar in size, with a longer tail, which lacks the wires. Her nape and crown are also bare, but the skin is a darker blue. Otherwise she is cryptically drab-coloured.*

[*Cicinnurus respublica*, Batanta Island, Indonesia. Photo: Konrad Wothe]



*The **Standardwing Bird-of-paradise**, the only member of the genus* Semioptera, *is an aberrant species restricted to Halmahera and two nearby islands, in the north Moluccas. It appears to be a sister form of the sickletail–*Paradisaea *group, a theory supported by its green adult male ventral plumage. Two grossly elongated white lesser coverts form the "standards" after which the bird is named; these can be as long as the rest of the wing or even longer. The feathering of the chin and throat becomes increasingly dense to form an extensive breast shield of iridescent emerald-green.*

[*Semioptera wallacii halmaherae*, Halmahera, Moluccas. Photo: Tim Laman]

macgregorii), have a distinct grey juvenile plumage, unlike the brownish-olive of the females and very different from the adult male. This grey juvenile plumage, however, is worn for only a brief period, before the moult into the more female-like immature plumage. The juvenile of the third member of this subfamily, the Yellow-breasted Bird-of-paradise, has not yet been described, but it is suspected that it may have a grey plumage, like that of the two *Cnemophilus* species.

When moving over longer distances, paradisaeids use a typically distinctive undulating flap-and-glide action, the wings held closed against the body during upward intermissions between bouts of flapping. The wings of adult males of many genera produce a characteristic sound during flapping flight, and adult males of some polygynous species are capable of controlling the production and volume of wing noise during flights and courtship flights around their display courts. Most species performing the latter have blackish to black, dense and glossy flight-feathers that produce a dry rustling sound as they move against each other. Adult male Magnificent and Wilson's Birds-of-paradise (*Cicinnurus respublica*) make a sharp and clear clacking noise as they fly about their courts, but how this is produced remains to be studied. It is possible that the slightly to highly modified outer



*The **Twelve-wired Bird-of-paradise** is the sole member of the genus* Seleucidis. *It has affinities with the riflebirds* (Ptiloris), *through its male and female plumage and bill morphology, while another set of characters, including filamentous yellow flank plumes and pale legs, link it to the* Paradisaea *lineage. The white central shafts of six flank plumes on each side are elongated beyond the webs into black "wires", which after curving upwards become white again. The elongated, inward-curving yellow plumes of the male fade rapidly in captivity and in museum specimens; this ephemeral pigment may be derived from certain foods. Uniquely among the family, the thighs of the male are bare; they are pink, like the legs.*

[*Seleucidis melanoleucus*. Photo: Brian J. Coates]



Paradisaea *is the genus of the seven "true" plumed birds-of-paradise, of which the* ***Red Bird-of-paradise*** *is among the least typical. This genus is defined in adult males by both the filamentous elongated flank plumes, and the greatly elongated, wire-like or tape-like central rectrices. In the Red Bird-of-paradise, the central rectrices have been modified into gently twisting, concave, shiny black tapes of plastic-like appearance and texture, 3–4 mm wide. The slightly stiffened, downward-curving flank plumes are carmine to crimson, and variably dark brown to medium-brown on the upper surface, with off-white filamental tips.*

[*Paradisaea rubra*. Photo: Brian J. Coates]

primaries of adult males of several genera create wing noise during flight, but this is yet to be confirmed.

Courtship display-flights are of rare occurrence within this family, and the few that have been noted are, for the most part, inadequately described. Certainly, the long white central rectrices of flying or hopping adult male Ribbon-tailed Astrapias (*Astrapia mayeri*) and the white standards of Standardwing Birds-of-paradise can be seen from considerable distances (see Breeding).

Habitat

Birds-of-paradise are predominantly restricted to tropical closed wet forests from Wallace's Line eastwards and then south-eastwards to the east coastal zone of Australia. The four species living in Australia are restricted to small remnant rainforest patches. One species, the Paradise Riflebird (*Ptiloris paradiseus*), is found in subtropical and temperate rainforests, extending also to wet sclerophyll forest adjacent to rainforest and to dry sclerophyll forest more than 1 km from rainforest. An exception to this general picture of paradisaeid habitat selection is the widespread Glossy-mantled Manucode (*Manucodia ater*), which commonly inhabits open savanna woodland, as well as rainforest, over large areas of New Guinea. Similarly, Curl-crested Manucodes inhabit both dense rainforest and open savanna-like plant communities of the D'Entrecasteaux Archipelago, off the south-east corner of that island.

All members of the family depend upon closed humid forest over most, if not all, of their geographical range. Indeed, most species are habitat specialists, this being true especially of the montane ones. Ten species occupy a single environment, and only three or four typically utilize more than three habitats, mostly lowland ones, as typified by the Raggiana Bird-of-paradise, which ranges into hill habitats. The geographically most restricted species live in mid-montane forests, at 1200–2500 m, and it is here that the greatest number of species occur sympatrically. For example, nine paradisaeid species co-exist at around 1480 m on Mount Missim, in east New Guinea.

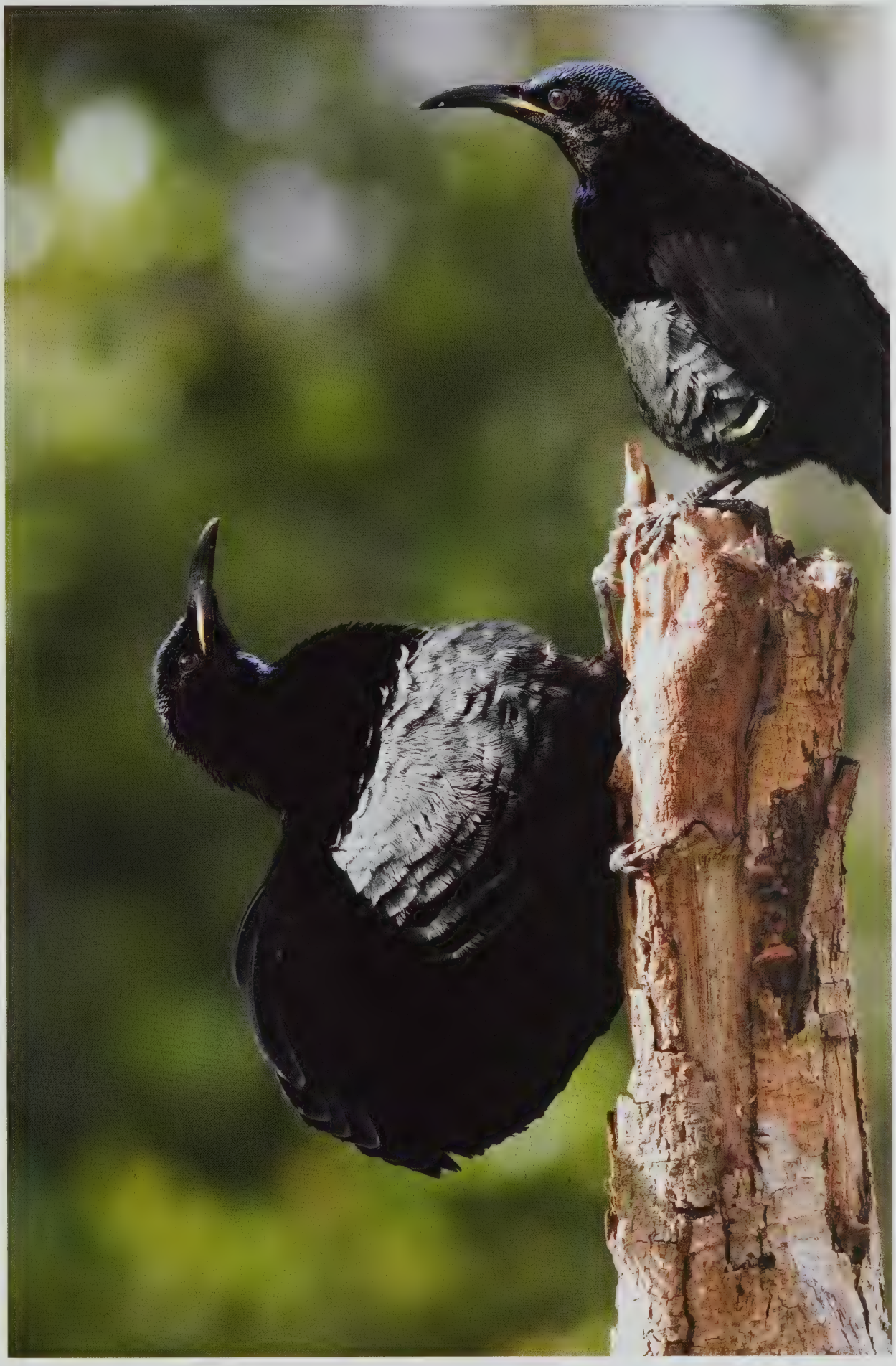
Manucodes in New Guinea are far more tolerant in terms of habitat than other birds-of-paradise. Some lowland forests support as many as three manucode species, but it is not known how they co-exist ecologically (see Food and Feeding). The clearly defined and altitudinally limited distributions of different forest habitats dictate the geographical distributions of the various species in New Guinea, with the largest number concentrated in the range 1000–2000 m. The Trumpet and Curl-crested Manucodes may have wider elevational ranges than those of any other family-members. The distributions of the Crinkle-collared and Jobi Manucodes (*Manucodia jobiensis*) indicate the importance of altitude, with the former adapted to upland forest and the latter to lowland forest, with complete and broad geographical overlap, but also with little or no sharing of specific habitat.

Magnificent and King Birds-of-paradise occupy marginally overlapping habitat zones, the former living in upper hill and lower montane zones and the King Bird-of-paradise in lowlands and hills. Black and Brown Sicklebills (*Epimachus meyeri*) demonstrate a similar example of limited overlap in mid-montane forest, the former at lower elevations and the latter at higher ones, and the Raggiana and Blue Birds-of-paradise provide another, with the Raggiana below the Blue but, in this case, with considerable overlap. In the Huon Peninsula of north-east New Guinea, the Emperor Bird-of-paradise inhabits the uplands and the Raggiana Bird-of-paradise the lowlands, their populations meeting in upper hill forests. Further, Ribbon-tailed Astrapias meet Stephanie's Astrapias (*Astrapia stephaniae*), and hybridization between them occurs, where the otherwise discrete elevational ranges of the two species abut.

Within the Paradisaeidae, only ancestors of the manucode and Paradise Crow lineage, comprising the genera *Manucodia* and *Lycocorax*, and members of the plumed paradisaeine clade, containing *Cicinnurus*, *Semioptera*, *Seleucidis* and *Paradisaea* (see Systematics), show evidence of the ability to colonize islands across deep-water barriers. The present distributions of some montane New Guinea taxa, including apparently anomalous ones incompatible with usual dispersal models of New Guinean biogeography, may reflect the dramatic geological movements, both vertical and lateral, of various parts of the island.

General Habits

Apart from the breeding behaviour of this family, which has been well studied for several of the species, the behaviour of the Paradisaeidae is not particularly well known. The majority of the species are normally seen as singles, although the monogamous ones are often found in pairs or, in some cases, in



Apart from the breeding behaviour of the Paradisaeidae, which has been well studied for several species, the behaviour of this family is not particularly well known. Most species are normally seen singly, although the monogamous ones are often found in pairs or, in some cases, in small groups. A few species will sometimes assemble at sources of food. The riflebirds, for example, occasionally gather in small flocks at fruiting trees, and gatherings of up to 50 ***Victoria's Riflebirds*** *have been recorded in orchards during the winter months. The degree of intraspecific aggression apparently varies. Fights and chases may occur when an individual male encroaches on the range of another. Some species appear to be less aggressive. Although they are solitary, sedentary and territorial during the breeding season, it is by no means unusual for up to five adult male Victoria's Riflebirds to forage together, with no signs of aggression among them, even when in the core area of another male. Among the species that gather to display at leks, however, fights between males are not uncommon, and it seems likely that some level of fighting is necessary to maintain the mating hierarchy. Recently formed leks tend to have fewer males demonstrating more aggression. Once the hierarchy is established, aggression is reduced, and older leks tend to have more males and less aggression.*

[*Ptiloris victoriae*, Atherton Tableland, NE Queensland, Australia. Photo: Clifford & Dawn Frith]



*The **Emperor Bird-of-paradise** is an atypical member of the genus* Paradisaea, *with its sparse filamental flank plumes ventrally and basally pale orange-yellow but predominantly white. This species also has a patch of elongate white feathers on either side of the belly, giving an impression of flank plumes expanding across the underparts and almost meeting centrally. Birds-of-paradise are typical passerines in having ten primaries, the outermost of which is fairly well developed, ten to twelve secondaries, and twelve rectrices. Little has been documented with regard to the maintenance behaviour of the Paradisaeidae, although they are known to visit forest pools and flooded tree knotholes in order to bathe. Bathing is generally followed by preening. In Australia, riflebirds* (Ptiloris) *have been observed to bathe in shallow pools and in other suitable sites. A male Magnificent Riflebird* (P. magnificus) *was watched while it bathed several times in a riverside pool, and between bathes perched nearby on a sunlit log and preened. On subsequent days, several individuals of both sexes bathed in the same pool at about midday. For several months during a severe drought, a male Paradise Riflebird* (P. paradiseus) *regularly bathed in the late afternoon in an artificial pool in a garden. His visits ceased as soon as a storm broke and relieved the harsh conditions. Paradise Riflebirds often perch in trees in the morning, and proceed to sunbathe and preen.*

[*Paradisaea guilielmi.* Photo: Brian J. Coates]



*The adult male **King of Saxony Bird-of-paradise** has a characteristic advertisement song: a dry rattling jumble of insect-like notes poured out at a rapid pace (suggestive of bad radio static), which briefly turns into a twittering at its climax. Most birds-of-paradise produce distinctively loud and harsh vocalizations. While both sexes of the monogamous species call regularly, only the males of the polygynous species typically produce vocalizations, in the form of advertisement calls. There are few records of vocal mimicry by wild birds-of-paradise, but a King of Saxony Bird-of-paradise may have incorporated the calls of smaller passerines into its courtship subsong.*

[*Pteridophora alberti*, Tari Gap, EC New Guinea. Photo: Pete Morris]

small groups. A few will sometimes assemble at sources of food, the riflebirds, for example, occasionally gathering in small numbers at fruiting trees, and gatherings of up to five Victoria's Riflebirds (*Ptiloris victoriae*) have been recorded in orchards during the winter months.

From the little information available, it would seem that most birds-of-paradise are sedentary within small, permanent home ranges. They are for the most part rather shy, and can be difficult to observe. Indeed, some, such as the Trumpet Manucode, are extremely secretive and very hard to locate, but they often reveal their presence by the distinctive calls which they utter (see Voice). All members of the family are markedly arboreal, keeping mostly to the middle and upper levels of the forest, although they will also, particularly when foraging in mixed flocks, descend to lower levels and occasionally, as with the Paradise and Victoria's Riflebirds, forage on the ground. Promiscuous adult males advertise the location of their leks, courts or display perches mostly during the early morning and late afternoon, but by no means exclusively so during peak courting months.

One or more bird-of-paradise species are typically present in mixed foraging flocks in the New Guinea lowlands and hill forest. These include, at least, manucodes, Stephanie's Astrapia, Western (*Parotia sefilata*) and Lawes's Parotias, the Magnificent Riflebird, the Superb Bird-of-paradise, all sicklebills, the Magnificent Bird-of-paradise, the King and Twelve-wired Birds-of-paradise, and the *Paradisaea* species. In such flocks male birds-of-paradise call regularly, as if maintaining flock cohesion. Flocking is more important to lowland-forest species than to those in upland forest, partly because of the less species-rich bird and insect communities at higher altitudes.

The medium-sized to large bird species that typically form mixed foraging flocks are generally brown and/or black in plumage, and this common appearance may facilitate social cohesion, as well as possibly confusing potential predators. All female birds-of-paradise and some males that join mixed flocks fit this pattern. It is conceivable that some kind of "social mimicry" has played a part in this similarity in appearance across taxonomically diverse flocking species. It was suggested that this might specifically involve mimicry of the appearance of New Guinea Babblers (*Pomatostomus isidorei*) and various pitohuis (*Pitohui*), the most typical of flock-leaders. This suggestion is particularly interesting because it preceded the amazing discovery that the Hooded Pitohui (*Pitohui dichrous*) and other pitohui species have toxic feathers and skin. In this regard, it is noteworthy that, in earlier times, some birds-of-paradise, including Buff-tailed Sicklebills and Raggiana Birds-of-paradise, eaten by hungry zoological collectors were found to be distasteful.

The discovery of defensive toxins in brownish and brown-and-black pitohuis provided the basis for a speculative explanation of the conspicuously atypical bird-of-paradise plumages found in the genus *Paradisaea*. In this genus, most female and immature plumages differ distinctly from the plumages of most other birds-of-paradise, the females and immatures of which are typically brownish above and barred below. A tentative explanation for this striking exception within the Paradisaeidae is that female-plumaged *Paradisaea* broadly mimic the appearance of typically mixed-flocking and/or toxic species in order to participate in mixed flocks, if not to look like toxic birds. Among the adaptive advantages of mixed-species flocking are that of an anti-predator strategy, whereby many pairs of eyes, including those of "sentinel" species, make it safer for individuals to maximize the time spent in foraging, and that of a mutually beneficial foraging effect, whereby small mobile prey may be flushed by one flock-member into the field of view of another.

The degree of intraspecific aggression apparently varies. Fights and chases may occur when an individual male encroaches on the range of another. Some species, however, appear to be less aggressive. Male Victoria's Riflebirds, for example, are not territorial during the winter period, and very little or no fighting seems to occur when they assemble at foraging sites. During the breeding season, too, it is by no means unusual for up to five adult males of this species to forage together with no signs of aggression among them, even when in the core area of another male.

While most birds-of-paradise are armed with a powerful bill and feet, and can pugnaciously use them, their many natural enemies include such dangerous predators as hawks, including *Accipiter* species, and snakes. Nevertheless, few documented records of natural predation exist.

Little has been documented with regard to the maintenance behaviour of this family. These birds visit forest pools and flooded tree knotholes in order to drink or bathe. In Australia, riflebirds have been observed to bathe in shallow pools and in other suitable sites, and for several months during a severe drought a male



The range of bill shapes reflects the wide range of dietary preference among the birds-of-paradise. Some, such as the wide-gaped and weak-billed cnemophilines, may be entirely or almost entirely frugivorous, but most species for which information is available consume both fruits and arthropods. ***Stephanie's Astrapia*** *eats mostly fruits, but also insects, spiders, frogs and skinks. This species forages mostly in the middle and upper forest strata, usually singly, or in small loose groups. It will also join mixed-species feeding flocks with Brown Sicklebills* (Epimachus meyeri)*, with which it hybridizes extensively in the west of its range.*

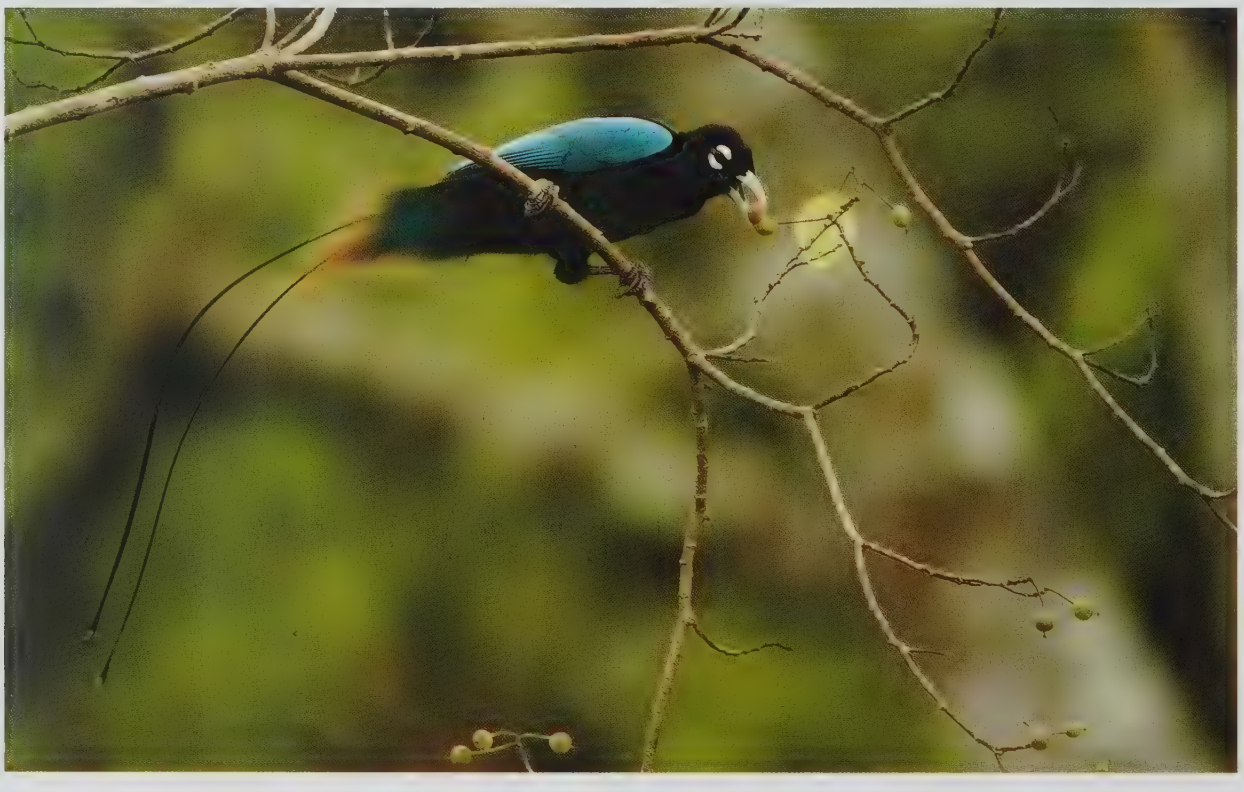
[*Astrapia stephaniae*, Tari Gap, EC New Guinea. Photo: Tim Laman]

Paradise Riflebird regularly bathed in the late afternoon in an artificial pool in a garden, his visits ceasing as soon as a storm broke and relieved the harsh conditions. A male Magnificent Riflebird was watched while it bathed several times in a river-side pool, and between bathes perched nearby on a sunlit log and preened; several individuals of both sexes bathed in the pool at about midday on subsequent days. A male of this species was seen to chase off two Graceful Honeyeaters (*Meliphaga gracilis*) from a pool where they were bathing, and then to enter the pool himself. Preening generally follows bathing, and Paradise Riflebirds often perch in trees in the morning and proceed to sun-bathe and preen. In New Guinea, Papuan hunters used to set artificial perches at pools and, when the birds came to bathe or drink, they were able to kill them for their plumes or for food (see Relationship with Man).

There appears to be little information on the roosting behaviour of the family. Twelve-wired Birds-of-paradise are known to roost relatively low down, whereas male Standardwing Birds-of-paradise roost above their leks.

Voice

Birds-of-paradise produce distinctively loud and harsh vocalizations that have been described as corvid-like. Adults of both sexes of the monogamous species call regularly. Among the



Species that depend more on fruit tend to range more widely in search of food, and are non-territorial, or defend only their display site rather than an all-purpose territory. Female ***Blue Birds-of-paradise*** *will however defend a food resource such as a branch, vine or small fruiting tree, and will aggressively expel other birds that try to forage there. This is unusual behaviour for frugivores. Adult male Blue Birds-of-paradise usually forage alone, but are sometimes found with individuals in female-type plumage, and with other species of bird-of-paradise. Paradisaeids in mixed flocks usually interact little with other birds, and typically leave the tree after having consumed a relatively small quantity of fruit.*

[*Paradisaea rudolphi margaritae*, Tari Gap, EC New Guinea. Photo: Tim Laman]



When seeking animal prey, most species hop about foliage, boughs and tree trunks, repeatedly lifting and tearing at dead foliage, epiphytic growth and bark. The relative proportions of fruit and animals in the diet of the ***Twelve-wired Bird-of-paradise*** *are estimated to be 50:50. The animal component is mostly arthropods, but also small vertebrates such as frogs, and lizards. This species forages acrobatically, hanging upside-down to probe holes in tree branches. Manucodes* (Manucodia) *forage for animal prey by upright gleaning among twigs and foliage, a technique that is a little unusual for such large birds, and far more typical of considerably smaller gleaners.*

[*Seleucidis melanoleucus*, New Guinea. Photo: Roland Seitre]

polygynous species, on the other hand, it is typically only the males that produce vocalizations, these in the form of loud and regular advertisement calls some of which may carry 1–2 km, the females being mute other than when alarmed. The relative range of vocalizations of the two sexes of polygynous species is, however, difficult to ascertain, as many young males wear female-like plumage for several years.

Exceptions to the typical loud corvid-like male calls include weak and rather pathetic-sounding high-pitched notes, given by some manucodes and Loria's Bird-of-paradise; a staccato series of explosive notes remarkably like the sound of a machine-gun, uttered by the Brown Sicklebill; a complex "fizzing" song sounding like radio-static, by the King of Saxony Bird-of-paradise; a loud clear "popping", by the Emperor Bird-of-paradise; and an almost unbelievable humming-like sound as if from an electric motor, emitted by the courting Blue Bird-of-paradise. When courting, as distinct from prior advertisment-calling, males of the *Paradisaea* species are relatively quiet, sometimes giving just a few brief soft notes accompanied, in some species, by a sharp clicking sound produced with the mandibles; a similar clicking is made also by the Magnificent Bird-of-paradise, in the genus *Cicinnurus*. The elongate and coiled trachea of manucodes produces unique low tremulous notes (see Morphological Aspects).

While there have for a long time been few, if any, convincing records of vocal mimicry by wild birds-of-paradise, some recent recordings indicate the possibility that vocalizations of a court-



The ***Black Sicklebill*** *is just one of several species that feed on* Pandanus *fruits. Others include the Twelve-wired Bird-of-paradise* (Seleucidis melanoleucus), *for which this plant is known to be important, as it is suspected to be, too, for the Arfak Astrapia* (Astrapia nigra). *Sicklebills often use their long, curved bills to probe for animals among debris at the bases of* Pandanus *fronds, behaviour that has likewise been recorded for the Ribbon-tailed Astrapia* (A. mayeri).

[*Epimachus fastosus*, Arfak Mountains, New Guinea. Photo: Richard Kirby/ naturepl.com]



*With the exception of marginal habitats such as those at highest altitudes, most of the forests inhabited by birds-of-paradise support hundreds of species of fruit-bearing tree, vine, liana and shrub. This **Victoria's Riflebird** appears to be feeding on nectar from these trumpet-shaped flowers, which are cauliflorous—coming directly out of the tree trunk and limbs rather than from branches or twigs. Nectar-feeding in this species is known but is rarely observed, and this may be the first published photograph of it.*

[*Ptiloris victoriae*, Jullaten, Australia. Photo: Rohan Clarke]

ing male King of Saxony Bird-of-paradise and a Wilson's Bird-of-paradise may have involved mimicry of the calls of smaller passerines, notably of *Sericornis* scrubwrens. This does, of course, require confirmation. A male Raggiana Bird-of-paradise, which was hand-raised from a nestling and which lived for many years in a wildlife sanctuary, did mimic a few words and whistling of local people, apparently in the context of "courting" humans, upon which it was imprinted.

Male Black Sicklebills vocalize during courtship, whereas male Pale-billed Sicklebills (*Drepanornis bruijnii*) have not been recorded as doing so, the latter giving, instead, a bill-rattle. Although courting parotias display largely in silence, male King of Saxony Birds-of-paradise produce a continuous varied busy whisper-song while perch-bouncing and in pre-copulatory display. In the latter context, sickletails, too, vocalize softly. Unique among the *Paradisaea* species is the mechanical-sounding buzzing given by the male Blue Bird-of-paradise in inverted display (see Breeding).

Courting male Standardwing Birds-of-paradise emit vocalizations characteristic of both *Cicinnurus* and *Paradisaea*, with additional high-pitched twittering noises. During their display, they also repeatedly beat their carpal joints sharply together to produce loud cracking or snapping sounds, which is analogous to the beating of the carpal joints by courting males of several *Paradisaea* species, in the latter producing a softer audible thud (see Breeding). Various other non-vocal sounds that displaying paradisaeids produce may act as auditory advertisement: These include wing-beating, bill-rattling, primary-rustling and wing-snapping.

Food and Feeding

There is a wide range of dietary preference among the birds-of-paradise, as is in part reflected by their range of body sizes and bill shapes (see Morphological Aspects). The majority of the species for which relevant information is available consume both fruits and arthropods, but some, such as the Buff-tailed Sicklebill and the Superb Bird-of-paradise, are primarily insectivorous and others, such as the cnemophilines, are entirely or almost entirely frugivorous. Something is known of the diets of 25 of the members of the family, and there is fragmentary knowledge for all other species except Wilson's Bird-of-paradise. All of the species for which information is available are known to take fruit. Thus, birds-of-paradise are first and foremost frugivores, arthropods comprising the second major component of the diet. Species that depend more on fruit tend to range more widely in search of food, whereas the more insectivorous ones are more sedentary. As a generalization, therefore, adult males of some polygynous species, notably the predominantly insectivorous ones, defend all-purpose territories, whereas most other species are non-territorial or defend only their display site.

Frugivores forage mostly in the canopy of fruiting trees, whereas insectivores search for food in bark and foliage in the forest canopy or middle storey, by gleaning and by probing rotten wood. The former tend to be more sociable, whereas the insectivores are generally more solitary and, furthermore, territorial.



*A common technique when foraging for insects is the probing and tearing of dead wood. The **Brown Sicklebill** takes a similar approach to epiphytic plants. This bird appears to be using open-bill probing, a technique that involves inserting the closed bill into soft wood or debris, and then opening the bill and exposing prey. Buff-tailed Sicklebills* (Drepanornis albertisi) *sometimes open the bill wide before probing, and insert only the lower mandible into wormholes and knotholes in order to spear prey. Adult male Brown Sicklebills appear to forage within a home range from which they exclude other adult males, but in which they permit individuals in female-type plumage to feed.*

[*Epimachus meyeri bloodi*, Mount Hagen, EC New Guinea. Photo: Tim Laman]

Beyond fruits and arthropods, the diet contains only minor additional constituents, small vertebrates, flowers and, apparently, nectar being consumed at times. Several species eat leaves when in captivity, and this is probably an uncommon but regular activity in the wild.

Fruit is the most common dietary component among the birds-of-paradise, foraging individuals typically feeding solitarily by plucking and consuming fruit from trees in the middle and upper storeys of forests. They may also join other frugivorous birds in fruiting trees, but usually interact little with them and typically leave the tree immediately after having consumed a relatively small number of fruits (see also General Habits). The most complex aspect of frugivory is that of fruit selection. With the exception of some marginal habitats, such as those at highest altitudes, most forests where birds-of-paradise live support hundreds of species of fruit-bearing trees, vines, lianas and shrubs. Several studies have revealed that each paradisaeid species consumes the fruit of only a small number of the available plant species. Preference for particular structural types, for drupe/berry, figs (*Ficus*) or capsules, differs from one species to another. For example, the Trumpet and Crinkle-collared Manucodes eat mostly figs, while Magnificent Riflebirds and the Superb, Magnificent and Raggiana Birds-of-paradise take more capsular fruits, and Lawes's Parotias eat more drupe/berry fruits.

The members of Paradisaeinae use their feet as tools with which to hold and manipulate foods, and they are thus able easily to extract the edible "reward" from capsular fruits. They harvest fruit while perched, rarely plucking it while in flight, and they are one of the most important groups of vertebrate dispersers of fruit seed in New Guinea; this is because they do not digest seeds, and are therefore not seed predators. The family Paradisaeidae contains more seed-dispersing mainland New Guinea frugivore species, 35 in total, than any other family of vertebrates, the pigeons (Columbidae), with 24 primarily frugivorous species, coming second. A single individual of some bird-of-paradise species will defend a compactly restricted fruit resource, such as a branch, vine or small tree, and spend a significant part of each day in foraging, resting and aggressively expelling other birds that try to forage upon it. This is unusual behaviour for frugivores at fruit resources.

There are no exclusively insectivorous species in this family, and even the primarily insectivorous ones take, in combination, a range of fruits typical of their more frugivorous relatives. Although observations are limited, arthropods eaten by birds-of-paradise include caterpillars, beetles (Coleoptera) and their larvae, katydids (Tettigoniidae) and their relatives in the order Orthoptera, and ants (Formicidae). Three fundamental methods of insectivory have been described: these are bark-gleaning, the probing and tearing of dead wood and foliage, and the generalized gleaning of twigs and foliage. The first two are common among most paradisaeine birds-of-paradise, and the last appears to be more typical of the manucodes. When seeking animal prey, the majority of species hop about foliage, boughs and tree trunks scansorially, repeatedly lifting and tearing at dead foliage, epiphytic growth and bark. In upper montane forests, which support ubiquitous moss and epiphytic growth, birds-of-paradise commonly seek prey by pulling apart,



Riflebirds (Ptiloris) *are remarkable among paradisaeids in clinging to substrates with their powerful feet and claws, enabling them to use their long, strong decurved bills to probe and tear bark and dead wood, in a manner reminiscent of woodpeckers (Picidae). They also use open-bill probing into soft wood or debris.* ***Victoria's Riflebird*** *forages mostly in canopy, but also close to and even on the forest floor. It probably takes more arthropods than fruits overall, including spiders, centipedes and millipedes, as well as insects such as cockroaches and cicadas, although the relative proportions vary seasonally.*

[*Ptiloris victoriae*, Atherton Tableland, NE Queensland, Australia. Photo: Clifford & Dawn Frith]



There have been few observations of the feeding behaviour and dietary preferences of the ***Greater Bird-of-paradise****, but these are probably similar to some of its congeners which seem to eat mostly fruit, particularly capsular fruit and figs, but also arthropods. This bird is spitting out a nutmeg* (Myristica) *seed, having consumed the flesh around it. Because they do not digest seeds, the birds-of-paradise play a major role in seed dispersal. The family contains 35 seed-dispersing species on mainland New Guinea, more than any other family. The pigeons (Columbidae) come second, with 24 species.*

[*Paradisaea apoda*, Aru Islands, Indonesia. Photo: Loïc Degen]

or probing into, mossy clumps. While typical birds-of-paradise use their feet to hold prey, in order to tear it apart, this behaviour has not been recorded for the weak-footed cnemophilines, which are obligate frugivores (see also Morphological Aspects).

Manucodes forage for animal prey by upright gleaning among twigs and foliage, which requires no specialized physical abilities. This foraging method is a little unusual for birds as large as the manucodes, being far more typical of considerably smaller gleaners of twigs and foliage. Riflebirds are remarkable in clinging to substrates with their powerful feet and claws, enabling them to use the long, strong decurved bill to probe and tear bark and dead wood, in a manner reminiscent of the woodpeckers (Picidae), when seeking animal prey. They also use open-bill probing into soft wood or debris; this technique, sometimes referred to as "*Zirkeln*", involves the insertion of the closed bill into a substrate and then opening the bill and thus exposing prey. Buff-tailed Sicklebills sometimes utilize the narrow sickle-shaped bill to probe into wormholes and knotholes, at times opening the bill wide and inserting only the lower mandible in order to spear prey. Short-tailed Paradigallas (*Paradigalla brevicauda*), Brown Sicklebills, Splendid Astrapias and Ribbon-tailed Astrapias will occasionally consume frogs or skinks (Scincidae), and it seems probable that most larger birds-of-paradise also do so to a greater or lesser extent.

Adults representing at least seven or eight paradisaeine genera and one cnemophiline, the Yellow-breasted Bird-of-paradise, regurgitate food into the bill before reswallowing it, or to feed their offspring, or simply to drop seeds, and this behaviour is probably typically performed by all family-members. Seeds dropped or excreted on or around terrestrial display courts of the Magnificent Bird-of-paradise and the parotias attract ground-foraging granivorous pigeons. In this interaction, the pigeons obtain food as they clean the courts of the birds-of-paradise.

In the Crested Bird-of-paradise, both the parent female and her offspring eat exclusively simple fruits, and this may well prove to be true of all three species in the Cnemophilinae (see Breeding). Paradisaeine parents discriminate in the matter of food items to be fed to their young on the basis of the latter's age, most initially feeding the nestlings with arthropods. After the chicks reach a certain age, they are fed predominantly with fruit or with both fruit and insects. The arthropods presumably provide calcium, which is necessary for bone formation, provide structural proteins, which are critical for tissue growth, organ and feather production, and contain lipid, for energy. Once nestlings reach a certain mass, a range of fruits can probably meet their dietary needs. In a study of the nesting biology of the Trumpet Manucode, however, an unexpected finding was that these monogamously pair-bonding birds are frugivorous specialists that raise their nestlings on a diet almost exclusively of fig fruits. For these nestlings to be provided with the necessary macro-nutrient building blocks required for their growth, massive amounts of low-nutrition figs must be supplied to them; the nestlings apparently receive an oversupply of sugar and carbohydrate, but insufficient lipid and protein, the last two being found in good quantities in arthropods.

A largely frugivorous diet is considered a main pre-condition of polygyny among rainforest birds, the males of which spend most of their time in advertising, attending and defending a traditional courting site, solitary or communal, at which they perform elaborate displays. Annual seasonal fruit abundance in these birds' habitats appears adequate to enable males to be emancipated from nesting duties, thus permitting male promiscuity and the evolution of court-based or lek-based behaviour, and sufficient to enable females to raise offspring unaided. It is probable that the sexes of the adults, because they have differing needs in terms of energy and time budgets, face differing foraging demands, the females requiring more arthropods while nesting, and the males seeking foods, such as fruits, that minimize foraging time, allowing them to maximize the time spent at display sites. Some recent fieldwork on birds-of-paradise has focused on the importance of dietary ecology and specialized frugivory in the evolution of court and lek behaviour (see Breeding).

Breeding

Annual cycles of birds-of-paradise are little studied. Combining various pieces of evidence of breeding for an extensively distributed species results in the perception of a misleadingly long nesting season, because it includes populations that must, perforce, follow differing cycles according to local conditions. Despite this, a review summary of breeding seasonality does indicate some useful broad patterns, revealing that more breeding occurs during August–January than during February–July, with March–June the least productive period. Breeding presumably coincides with



Birds-of-paradise are found almost exclusively in humid forest habitats. They visit forest pools, flooded knotholes and stumps to drink, although some species may also come to artificial pools in gardens. The ***King Bird-of-paradise*** *forages at various levels of the forest; the proportions of fruit to arthropods in its diet are not known. It joins mixed-species foraging flocks that may include its congener, the Magnificent Bird-of-paradise* (Cicinnurus magnificus), *and also* Paradisaea *species. Flock members can gain from the mutually beneficial foraging effect, capturing prey flushed by other members.*

[*Cicinnurus regius*, near Brown River, SE New Guinea. Photo: Brian J. Coates]



Males of the polygynous species exhibit a variety of forms of behaviour, from solitary and non-territorial through to true communal lekking, with a range of intermediate strategies. The commonest system, adopted by males of at least ten species, is solitary and non-territorial display, but within this there exists considerable variation in terms of dispersion and behaviour. Some of these species, such as the ***Magnificent Bird-of-paradise****, establish cleared terrestrial display courts, which they modify, most commonly by simply removing leaves from the immediate vegetation. This "gardening" may have several functions. By removing foliage that hinders display, the male can provide better visibility, improving his view of approaching females or predators, providing better illumination of the display site, and creating a conspicuous visual marker of the display site for conspecifics. The courts of the Magnificent Bird-of-paradise are found on steep slopes, notably in treefall or landslip areas, beneath a gap in the forest canopy. Court owners spend much of their time perched on vertical saplings within the court, which they defoliate and wear smooth with use. The male of this species is non-territorial, but maintains a home range around the court, which overlaps with the home ranges of one or more other adult males. The mean nearest distance of five males at courts on Mt Missim, in south-east New Guinea, was 209 m. Males maintain auditory contact by calling while moving about their home ranges. A court may be maintained for at least three consecutive years.*

[*Cicinnurus magnificus*, Mount Hagen, EC New Guinea. Photo: Jean-Paul Ferrero/ Auscape]

greater abundances of fruit and arthropod foods, as appears to be the case on Mount Missim, in eastern New Guinea, and as confirmed for Victoria's Riflebird of Australia. Relatively brief breeding seasons indicated for some species may reflect inadequate information and/or seasonal biases in observation, because, for some better-known members of the family, nesting has been recorded in virtually every month of the year.

The various mating systems within the Paradisaeidae can be classified according to male–female interactions and the kinds of male dispersion involved, the major dichotomy being between monogamous and polygynous species. While pairs of the monogamous species form social bonds and forage together, the lives of the sexes of polygynous species are far more divergent.

The five sexually monomorphic manucode species and the Paradise Crow are known, or are presumed, to reproduce as socially monogamous pairs, with the task of brood care shared by the two parents. The Glossy-mantled and Trumpet Manucodes maintain year-round pair-bonds, both sexes attending the nest and provisioning the offspring; at one Trumpet Manucode nest, both sexes also incubated the clutch. Male and female manucodes forage together and maintain contact by counter-calling. With the Trumpet Manucode, at least, males and females give sex-specific call notes, whereas this is apparently not so with polygynous species. Monogamous birds-of-paradise appear to be non-territorial, highly frugivorous and wide-ranging, having little opportunity to defend a foraging area.

Courting males of the monogamous manucodes perform brief and simple solitary displays on a randomly used forest-canopy perch. The courtship of the male Trumpet Manucode includes a chase followed by a frontal lunging display in which the head and bill are raised and the head, neck and throat feathering is erected; the opened wings are raised and tilted forwards so that the entire surface of each upperwing is directed towards the female, while the tail is widely fanned and a loud harsh call is uttered. One male of this species dropped his wings, cocked his tail, and gave a shivering display for 5–10 seconds before mounting the female. What little is known of the displays of other manucode species suggests that they are broadly similar to that just described.

The remaining 37 bird-of-paradise species, two of which are sexually monomorphic and 35 sexually dimorphic in plumage, are polygynous. The promiscuous males display and the females nest alone, the sexes meeting only briefly for courtship and mating. Males of these species provide the females with no foraging rights, nesting site, or help with nesting and brood-rearing. Males strive to rise in the mating hierarchy in order to be able to mate with as many females as possible; females struggle to produce one or two offspring per year. Males focus on intrasexual competition and on gaining favoured display sites; females focus on selection of the fittest mate, but they must invest most of their time and effort in nesting, incubating, and raising offspring. Court-holding males maximize the time at or near their court, in order to be able to court and mate at every opportunity. The females tend to range more widely, being restricted to a single location only when nesting. The promiscuous males advertise themselves by vocalizations and display posturing to attract as many females as possible.

Promiscuous males use traditional, or perennial, sites for advertisement, display and mating. These sites range from simple branches in the forest canopy or understorey to vertical tree-trunk stumps, fallen logs, or terrestrial courts cleared by the birds themselves. Males of most of the polygynous species modify display sites, most commonly by simply removing live leaves from the immediate vegetation. This "gardening" may function in one or more ways. By removing foliage that hinders display, the male can provide better visibility, improving his view of approaching females or predators, provide better illumination of the display site, create a conspicuous visual marker of the display site for conspecifics, and so on.

Males of all parotias and of the Magnificent and Wilson's Birds-of-paradise create cleared terrestrial display courts. Those of the latter two species encompass the bases of several sapling stems, from which leaves are plucked, and they become well worn with repeated use. The males constantly clean the court floor of plucked or fallen leaves, exposing a uniformly clean area of bare ground that contrasts with surrounding litter and the birds themselves. Parotias do not merely clear courts, but they then also "decorate" them with specific items such as pieces of chalk, sloughed snakeskin or mammal dung. While nesting females will carry such items away from courts, the presence of these items may also provide information about relative male fitness, as do bower decorations for the bowerbirds (see page 368).



*The courtship of the **Western Parotia** involves static and leg-flexing postures, with complex movements of flank plumes, pectoral shield, mantle cape, nuchal crest and occipital plumes. Intermediately dispersed breeding systems, in which males cluster loosely over a larger area, usually not in visual contact with one another, are termed "exploded leks". The male Western Parotia clears leaves and debris from a court roughly 2 m in diameter. The branches above are often stripped of leaves to make perches, where the male begins his display, before hopping to the court to perform his complex dance.*

[*Parotia sefilata*,
Arfak Mountains,
New Guinea.
Photo: Konrad Wothe]



*The solitary, court-based display of the **Magnificent Bird-of-paradise** involves dancing up and down the stem of a sapling with a complex, ritualized progression of movements of the nuchal cape, the pectoral shield, the curled, wire-like central rectrices, and the pale green gape. There are four display phases, two of which can be seen here. In the Back Display (upper left), the male turns upside-down on his vertical display perch, with the tail uppermost and the head lifted slightly upwards; he holds this position briefly before he turns his head uppermost. In the Breast Display (lower left), the breast-shield plumage appears to inflate and deflate as it is raised and lowered, the upper margins rising on each side of the head while undulations of the breast feathers send iridescent shimmers across it. The silent Cape Display is performed if a female moves closer, whereupon the male leans towards the horizontal, with the extended neck and bill directed at her, the cape erect and fully fanned, and the breast shield flattened and elongated. The slightly trembling male may maintain this posture for many seconds, as the female hops closer down the sapling. When she is within about 30 cm, he may suddenly perform the Dancing Display. In this, he pulls his head and neck back into his body, puffs and expands most of the plumage, including the pulsating breast shield, lowers his fanned cape, and cocks his tail over his back to present the iridescent upper surface of the central tail wires to the female. He then jerks his head from side to side, opening and closing the bill to expose the pale green inside of his mouth, and quivers his tail from side to side as he dances forwards up and then backwards down the sapling, with short, jerky movements of the body and head that emphasize his yellow cape.*

[*Cicinnurus magnificus hunsteini*, Sogeri Plateau, SE New Guinea. Photos: Brian J. Coates]





*The inverted phase of the display of the male **King Bird-of-paradise** follows the Horizontal Open Wings Display. His wings vibrating, he briefly rocks silently from side to side several times, before suddenly dropping to cling below his perch in the same pose, and repeating the display. He holds his bill open and turns his head from side to side for a few seconds, before he closes his wings and tightly sleeks his plumage, while remaining suspended. He peers around him, and then swings several times from side to side at a steadily increasing tempo, in the brief and silent Pendulum Display. He ends his display by righting himself atop his perch, or by simply dropping down and away from the perch. The King Bird-of-paradise is one of a number of species that uses the wings conspicuously in courtship. The Pendulum Display is the culmination of seven display phases, which focus mainly either on open and vibrating wings, or on movements of the pectoral fans and tail wires. A promiscuous, polygynous species, the King Bird-of-paradise has a system intermediate between a non-territorial one, and an exploded lek. Its arboreal courts are in the thick subcanopy vines of the shaded forest interior. The dispersion of courting males ranges from solitary individuals, 150–530 m or more apart, to a number clustered together. They are predominantly found in twos, 45–90 m apart, but an occasional group of four may gather to form a lek. The males vocalize persistently throughout the day.*

[*Cicinnurus regius regius*, Salawati Island, off NW New Guinea. Photos: Konrad Wothe]

Males of the polygynous species exhibit a variety of court-based behaviour, from solitary and non-territorial through to true communal lekking, with a range of intermediate strategies. The most common system, adopted by males of at least ten species, is solitary and non-territorial display, but within this there exists considerable variation in dispersion and behaviour. Some of these species, such as the Magnificent Bird-of-paradise, establish cleared terrestrial display courts, while others, such as the Magnificent Riflebird, display from a tree stump or fallen bough requiring little or no modification or tending. Some species display high above the ground, the Twelve-wired Bird-of-paradise being one such example, while most do so in the understorey or on the ground. Some appear to defend an exclusive all-purpose territory around their court, as illustrated by the Buff-tailed Sicklebill. Solitary courts result from the male's desire to avoid rivals, this system thus producing the greatest distances between each displaying male. Such solitary males tend to display less frequently in the absence of females than do those of species with communal display courts, the average solitary male spending more time in vocal advertisement and court maintenance and less time in male–female interaction. Courtship by solitarily displaying promiscuous males typically includes surprise elements of vigorous advance at females, including dramatic changes of size and appearance, attitude or sound, and it may even involve the pecking of females or the beating of them with the open wings.

Intermediately dispersed systems, in which males cluster loosely over a larger area, usually not in visual contact with one another, are termed "exploded leks". Males of at least two parotia species, Lawes's and Carola's Parotias, and of the King Bird-of-paradise, in the genus *Cicinnurus*, are known to form exploded leks or suspected of so doing. Male King Birds-of-paradise sometimes disperse as twos, each such group perching some 50–70 m apart from the next, but a range of dispersion exists, from solitary individuals to as many as four clustered together. Similar variation in male dispersion is found with Lawes's Parotia.

In true lekking species, of which there are least seven, namely Stephanie's Astrapia, the Standardwing Bird-of-paradise and five *Paradisaea* species, as few as two to as many as 40 or more males display within visual contact of each other, separated by distances of 0·5 m to 5 m, on small limbs with a diameter of about 2–4 cm in the canopy of one tree or, more rarely, several trees. Such leks tend to be several hundred metres to a kilometre or more apart. Males and females of these lekking species interact mainly or solely at leks, and these leks tend to be traditional, some being known to have been seasonally active at precisely the same location for more than two decades. Communal display systems promote competitive interaction among males. Older, more dominant males tend to control the social structure of the lek, younger and subordinate males associating with more experienced conspecifics. Fights between males are not uncommon on leks, and it seems likely that some level of fighting is necessary in order to maintain the mating hierarchy. The adult males displace immature males from the central part of the lek, if not from the entire lek. Once the hierarchy is established, aggression is reduced, and females can visit without excessive harassment by unruly males. Recently formed leks tend, therefore, to have fewer males performing more aggression and fewer female visitors, whereas older leks have more males, less aggression, and more female visitors. Females tend to choose to mate with centrally located males, which are older and more dominant, and copulating pairs are thus "protected" from predators by peripheral, subdominant and younger males, which are more exposed to possible predation.

Courting promiscuous males of the polygynous species use their brightly or contrastingly coloured plumage as a means of visually advertising themselves on their display perches. Some of them perform displays that are static and simple or involve simple chases or hopping from limb to limb, while others perform more discrete courtship movements in a highly stereotyped and ritualized sequence. The display perch of some species, exemplified by the vertical stump apex of Victoria's Riflebird, the Black Sicklebill and the Twelve-wired Bird-of-paradise, dictates that males perform a static courtship display or one limited to hopping up and down or over a limited area. A stout horizontal vine stem or tree limb permits a linear hopping or dancing display, as demonstrated by, for example, the Magnificent and Paradise Riflebirds, whereas a large fallen log or the surface of the ground allows semicircular hopping dances, as illustrated by, among others, the Superb Bird-of-paradise. Displays by males of solitary species are not universally different from those of com-



In order to attract females the displaying male ***Victoria's Riflebird*** *uses advertisement calls, which are accompanied by conspicuous wide gaping, to expose the bright yellow mouth. The solitary males are territorial with regard to their traditional display perches, at the tops of broken-off tree or tree-fern stumps, which may be many metres tall. Confined to the apex of the stump, the displays involve a static posture, dance, leg swaying, wing-clapping, wing movements and movements of the pectoral shield, and gaping. Courtship commences with the Circular Wings and Gape Display, shown here, directed at a female, the male turning so that he continuously faces her from the top of his stump.*

[*Ptiloris victoriae*, Atherton Tableland, NE Queensland, Australia. Photo: Clifford & Dawn Frith]



*Each adult male **Black Sicklebill** frequents a home range with singing and display perches on the tops of broken-off vertical tree trunks. The advertisement calls, which vary regionally, are audible over a kilometre away. The display, performed mostly in pre-dawn twilight, involves leg-flexing while leaning to the horizontal, and swaying with erect pectoral fans, flank and tail plumes, and possibly also gaping the bright yellow mouth. The Black Sicklebill will also stretch forwards and sway from side to side, while giving a quiet rattling call.*

[*Epimachus fastosus*, Arfak Mountains, New Guinea. Photo: Richard Kirby/ naturepl.com]

munally displaying males, but many of the former do clearly employ more static displays. Unique to true lekking species are "convergence" displays, in which dispersed males quickly and noisily return to, or converge upon, their lek perches at the approach of a female or females.

Courtship display is more complex among the more ornately plumed groups of paradisaeids. The elaborate nuptial plumage characters of adult males are specifically presented to females in a stereotyped manner during courtship. Thus, astrapias limb-hop, fly, and hang from perches in ways that best emphasize the long tail of these species; parotias raise the flank plumes to form a skirt, and erect the occipital and nuchal plumes; the King of Saxony Bird-of-paradise manipulates the occipital plumes, raises a mantle cape, and emphasizes its contrastingly pale wing patches by vibrating its wings; the riflebirds fully open the highly modifed wings; the Superb Bird-of-paradise raises an enormous nuchal cape and breast shield; and the sicklebills erect pectoral fans, raise the flank plumes, and fan the long tail. For every plume form there is a posturing and/or a movement to present it at its best. A diversity of species within the family uses the wings conspicuously in courtship, while others do not. Courting King and Standardwing Birds-of-paradise, along with most *Paradisaea*



*The male **Buff-tailed Sicklebill** defends a large, exclusive foraging territory around his court throughout the year. One male used a site of around 14 ha, with an average distance of 450 m from his display area to those of five adjacent males, for at least four years in succession. The courts include several perching sites, the males descending to the saplings below to court females. At the beginning of courtship, the male suddenly leans backwards to about 50 degrees, giving a convulsive jerk to spread his flank plumes into a perfect disk around the body, while opening his bill. The upper pectoral fan-plumes are held so that they become contiguous with the flank fan-plumes.*

[*Drepanornis albertisi*, Crater Mountain, EC New Guinea. Photo: Tim Laman]



*Little is known of the courtship behaviour of the **Crested Bird-of-paradise**, or indeed of any of the three cnemophilines. These species are polygynous. The male Crested Bird-of-paradise, presumed to be solitary, attends traditional advertisement-singing perches. One bird studied appeared to patrol a territory about 200 m in diameter, although territoriality in this species remains unconfirmed.*

[*Cnemophilus macgregorii*, Mount Hagen, EC New Guinea. Photo: Otto Plantema]

species, partly or fully open the wings in a motionless pose, and also flutter or flay them and/or beat their carpal joints together.

The brilliant flank plumes of adult males of the Twelve-wired Bird-of-paradise and the *Paradisaea* species are made more conspicuous by the raising of the wings, and in the case of lekking *Paradisaea* males this is followed by a static pose with the plumes raised and the head deeply lowered. During this communally static display of competing males, the females have the opportunity to inspect and compare their size and plumage while all males hold the same posture. This situation is developed one step further by lekking Emperor Bird-of-paradise males, which hang completely inverted, and motionless, from their perches. The solitary-displaying male Blue Bird-of-paradise similarly hangs upside-down, but with the wings tightly closed, as opposed to the open and raised wings of its lekking close relatives. In their inverted courtship postures, the males of the two last-mentioned species present plumage patterns of the abdomen that thereby become specifically visible to their female audience.

Leg-flexing is incorporated into many courtship displays, causing a statically perched or standing bird's body to rise and fall, or resulting in the individual leaping vertically up and down, and in some cases causing it to sway and/or rotate to one side or from side to side. Courting male King Birds-of-paradise invert themselves from perches in a remarkable manner that may involve an unusual form of leg-flexing. Not only do males hang suspended, but they also hold the much elongated body rigid, with the plumage tightly sleeked, while swinging rapidly from side to side like a pendulum.

Elaborate and vigorous use of the wings by courting riflebirds has resulted in remarkable modifications of the wing and component feather shape and texture, which produce loud and characteristic noises during certain stages of the display. During its courtship dance, the adult male Superb Bird-of-paradise's wings are rapidly flicked open and closed to produce a sharp loud clicking. Males of other solitary-displaying promiscuous males do not typically use their wings in courtship, and this general pattern is exemplified by the Blue Bird-of-paradise.

Other singular characters specifically presented by courting adult males include the pectoral fans of the sicklebills and the King Bird-of-paradise, the pale primaries of the Standardwing Bird-of-paradise, and the flank-plume wires and bare thighs of the Twelve-wired Bird-of-paradise. The tail is used in limited ways by courting males. The sicklebills and Wahnes's Parotia (*Parotia wahnesi*) have a graduated tail, which they repeatedly fan; with the longer-tailed Western and Wahnes's Parotias, the tail is, perforce, held to one side during terrestrial dancing movements. In the case of courting riflebirds, Superb Birds-of-paradise and all three sickletails, the tail is conspicuously cocked, and typical *Paradisaea* species, unusually, hold the elongated undertail-coverts well away from the tail.

Males of several paradisaeids possessing a brightly coloured mouth open the bill widely so as to present this signal in courtship, and, of course, they expose it when calling. Advertisement and courtship gaping is typical of adult male Loria's Bird-of-

*Display-flights appear to be rare within this family. Known exceptions include the **Ribbon-tailed Astrapia**. The long white central rectrices of the flying adult male can be seen from considerable distances. As well as drawing attention to itself with its white ribbons, the displaying male Ribbon-tailed Astrapia produces significantly louder wing noise than in normal flight. One or more male Ribbon-tailed Astrapias will jump back and forth between tree branches, their tail ribbons held up and arched, and their wings drooped. This is apparently lekking behaviour, although for this genus lekking has only been confirmed in Stephanie's Astrapia* (Astrapia stephaniae).

[*Astrapia mayeri*, Mount Hagen, EC New Guinea. Photo: Phil Gregory]







*The male **King of Saxony Bird-of-paradise** is assumed to be solitary, although there are unconfirmed reports suggestive of exploded leks. Courtship starts with singing from traditional perches, often beneath the foliage of emergent trees in the forest canopy, accompanied by open-bill gaping, and waving of the extraordinarily elongated occipital flag plumes. These plumes, which emerge from ear-tufts of elongate feathers, are up to 50 cm long—more than twice the length of the bird—and consist of a bare central feather shaft, with 40–50 plastic-looking "flags" decorating the outer side only. The upper surface of each flag is an enamelled-looking blue, and the underside dark brown. At a female's approach, the male drops into the understorey to a traditionally used vine 2–5 m above the ground. He perches up to 50 cm below the female, and emits a continuous hissing or whirring subsong, sometimes with gaping. In what is called the Understorey Bouncing Display, he repeatedly pumps or flexes his legs to bounce up and down, with the mantle cape and the breast shield erect, and the occipital plumes held over his back. The female is bounced about by the undulations of the vine. The occipital plumes are mostly held out horizontally behind him, swaying up and down as he bounces, but occasionally he brings them widely apart to a position in front of his head, and then back again. During a final, stiffly swirling display in which the occipital plumes are raised to about 45°, brought around the sides of the head and projected forward, the male progressively approaches the female, and copulation follows.*

[*Pteridophora alberti*, Mount Hagen, EC New Guinea. Photos: Tim Laman]



On Halmahera, leks of the ***Standardwing Bird-of-paradise*** *typically consist of 5–7 adult males, but 30–40 birds have been reported. The display involves limb hopping, with static postures, and flight displays with movements of the wings, pectoral shield and wing standards. The perch displays are like those of* Paradisaea, *but the Aerial Display is unique. This involves an "explosive" vertical leap from extended legs, and a nearly vertical ascent flight. At the peak of the flight, the wings are held fully extended and the bill turned downwards, then the birds "float" down while rapidly vibrating the conspicuously white primaries. Males perform this display one after another, sometimes in immediate succession.*

[*Semioptera wallacii*, Halmahera, Moluccas. Photo: Tim Laman]

paradise, and this species' conspicuous whitish gape-flanges may also function to enhance its display. Adult males of all riflebirds and the larger two of the sicklebills have small but visible gape-flanges that are as bright yellow as is the mouth of these species. Parotias, the Standardwing Bird-of-paradise and the members of the genus *Paradisaea* appear not to gape in display.

As the bright yellow legs and feet of the Standardwing Bird-of-paradise, the deep coral-pink ones of the Twelve-wired Bird-of-paradise and the blue ones of the three sickletails, as well as the bright blue bare head skin of Wilson's Bird-of-paradise, are brighter in colour on the males than on the females, this sexual difference may relate to courtship display. The Twelve-wired Bird-of-paradise has in addition, and uniquely within the family, pigmented bare thigh skin, which also features in display. Adult males of this species perform a tactile courtship display in which they brush their recurved flank-plume wires across the face of females. This fact may provide a clue to a possible function of similarly bare plume shafts of the central pair of rectrices of most *Paradisaea* species, although there appears to have been no remark on or discussion of such a potential use of this plumage feature.

Clearly, the polygynous birds-of-paradise include some of the most striking examples of extreme sexual dimorphism, such extremes apparently being related to the degree of reproductive competition among males, as reflected by the mating system concerned, which involves a display court or lek. This is emphasized not only by several male physical features, including size, coloration, ornate nuptial plumes and vocalizations (see Morphological Aspects and Voice), but also by sexual differences in reproduction-related behaviour, namely mate selection, competition for mates, nesting, and care of the offspring. Their elaborate male plumages are, therefore, reflected in highly complex courtship displays that involve both their extraordinary feather adornments and their elaborate dance and body movements. In the present work, limited available space prohibits detailed descriptions of all known displays of the Paradisaeidae. The following paragraphs provide what is a broad summary, but, as the main features tend to be fundamentally similar for all species within a genus, the courtship display of the best-known species of each is detailed, unless those of some congeneric species are extremely dissimilar. Displays of the three cnemophilines, the monotypic genus *Lycocorax* and the two *Paradigalla* are excluded, because little is known about the behaviour of these six species.

During the communal courtship display of Stephanie's Astrapia, the adult males erect the modified head and breast feathering. In low-intensity display, they hop between perches on the same level, with the body near-vertical and the tail swung forwards in an inverted "V" beneath each perch; a flicking sound is produced. In high-intensity display, males hop nine or ten times between two perches, the tail streaming behind, rather than swinging below the perch; the body is held horizontal, with the shoulders hunched and the bill pointed slightly upwards. Sometimes the wings are lifted, as though being stretched, so that the primaries are at right angles to the body, and the head is held downwards in the shape of a crook.

Whether the courtship of the Huon Astrapia (*Astrapia rothschildi*) is solitary or communal has not been confirmed, but it is known to include both low-intensity and high-intensity displays. During a silent low-intensity display, a male perches upright, with the slightly spread tail pushed forwards beyond the perpendicular and the breast feathering erected; the tail is sometimes rapidly and repeatedly fanned. In high-intensity display, he drops backwards under his perch, so that he is at right angles to it, with his body held almost horizontal but its anterior portion slightly lower than the posterior one, and with the head and neck turned upwards at one extremity and the tail upturned at the other. In this inverted posture, his elaborated plumage is again raised and expanded and the wings pressed tightly against the body, and his back feathers are expanded to cover the wings partly; the tail is held upright and first widely expanded, but then rapidly opened and closed. Males in the inverted position may also sway gently from side to side.

The solitary court-based courtship of Lawes's Parotia begins with a Bounce Display on a perch, followed by four terrestrial displays elements. The male, perched above his court as a female approaches, may bounce on his perch, sometimes reversing direction, while flicking his wings. Terrestrial courtship starts with the male clearing court debris at an increasingly rapid rate, his movements becoming more ritualized until he lowers his bill, but does not remove anything; he may adopt an Upright Sleeked Pose during court-clearing, but not immediately prior to further display. Suddenly, he briefly performs an Initial Display Bow as he brings the black frontal crest feathers forwards and above the



The polygynous and solitary adult male ***Twelve-wired Bird-of-paradise*** *displays at traditional perches, typically one or more adjacent vertical, leafless, often dead tree stumps protruding from the forest canopy. The perches are defended from other males; three vocal males mapped at two sites in eastern New Guinea were at a mean nearest-neighbour distance of 730 m. The display includes bill-fencing with the female, and the unique Wire-wipe Display, in which the male swipes the female across the face with his flank wires. The male's advertisement calls are accompanied by the raising of the open wings to expose his yellow flanks. When a female lands on his vertical display stump, the male initially erects various plumes as he approaches her. He pecks at her to entice her to perch beneath him, then turns his bill downwards to parry at her upward-pointing bill, and pursues her with a jerky gait. The male may perform the Wire-wipe Display as the female clings to the side of the perch beneath him. He stops pecking her, turns himself head uppermost, and performs slow body-swaying movements by hopping to alternate his foot positions. The body-swaying presents his yellow flank plumes, and causes the twelve flank-plume wires to brush across alternate sides of the female's face, neck or breast. He watches the female from over his shoulder as he directs his flank wires to best effect. At some stage, the female flies up over the male on to the perch apex, at which the male turns to face her, bill uppermost, and hops up to continue bill-fencing with her. He pulsates his breast shield rhythmically, and conspicuously exposes his bare pink thighs. Copulation may take place after a brief pursuit, or after many pursuits up and down the perch, with or without one or more Wire-wipe Displays.*

[*Seleucidis melanoleucus*, Karawari River, New Guinea. Photo: Tim Laman]

narial tufts. From this, he flicks his wings slightly out from the body to free his flank plumes, and stretches his body fully upwards on extended legs as his "skirt" is raised and spread and his occipital plumes raised, separated and brought above his head to project forwards while he shakes his head from side to side. Continuing to shake his head, he commences his Ballerina Pose dance from this point on the court, referred to as "point one". He moves sideways, with minute mincing steps, in a semi-circle, while rotating and bowing slightly to face point one, as he dances backwards to stop about 0·5 m away at "point two", and now facing point one; he pauses momentarily, but continuously shakes his head so as to wave his occipital plumes about. He then dances backwards to start a Back–forward Dance phase consisting of stepping backwards from point two to a position less than 0·5 m directly behind ("point three"), and then immediately forwards to point two again; he repeats this back–forward dance twice more in rapid succession. During the backward steps he holds the front of his "skirt" lowered, as in a curtsey, and then raises it to a level parallel to the ground during the forward steps; the occipital plumes remain forward-projecting throughout. Back at point two, the male then enters a brief stationary phase by crouching, bringing his skirt closer to the ground, and remaining momentarily motionless while bringing his occipital plumes upwards and backwards to nearly or just beyond the vertical, and then immediately forwards and downwards to an angle of 45°, as he draws himself stiffly upright and freezes in this posture. Suddenly, he crouches again, snapping his head directly downwards several times as he flicks his breast shield outwards and upwards so that it flashes an iridescent colour. Remaining crouched, he then bobs his head rapidly three or four times, first to one side and then to the other; the bill is held pointing forwards, and at the low point of each bob the head is central and the breast shield flicks out and upwards. This bobbing suddenly stops and, after a brief pause, the male Lawes's Parotia draws himself erect into a momentarily frozen posture as he brings his gathered occipital plumes around and backwards to a position over his back and then immediately forwards again, to just forward of vertical, and holds them widely separated. He then crouches again and pumps his head and neck vigorously up and down two to four times, during which the separated "flags" remain almost vertical and the frontal crest projects forwards over the narial tufts and bill. As his head reaches its lowest point, the breast shield is conspicuously but rapidly flicked upwards and outwards at its lower edge, this rapid movement resulting in flashing iridescent colours. The complete performance always ends, after the final head-pumping, with the male suddenly lowering all feathers to their normal positions and flying to a perch above or adjacent to his court, either immediately or after a brief bout of preening or court-clearing. A successful high-intensity display is concluded when the male lunges across its court, with the plumage sleeked and the head thrust forwards and horizontal to the ground, before hopping up on to a court perch to copulate. The complete courtship display of Carola's Parotia was recently described, and was observed to be the most complex of any known avian display.

The solitary courtship of the King of Saxony Bird-of-paradise starts with singing and display in the forest canopy, a male singing and adopting simple postures on traditional perches beneath the foliage of emergent tree perches, accompanied by open-bill gaping and the waving of the extraordinarily elongated occipital flag plumes. At a female's approach, he drops into the understorey to a traditionally used vine or vines about 2–15 m above the ground. He perches on his vine, up to 50 cm below the female, and emits a continuous hissing or whirring subsong, sometimes with gaping. He repeatedly pumps or flexes his legs vigorously to bounce up and down, with the mantle cape and breast shield erect and the occipital plumes held over his back, in the Understorey Bouncing display; the female being bounced about by the undulations of the vine. His occipital plumes are mostly held out behind him, roughly parallel to the ground, swaying up and down as he bounces, but occasionally he brings them widely apart to a position in front of his head and then back again. The female may hop up her perch a little, which causes the male to stop his bouncing, but not his hissing, and to hold his closed wings slightly away from the body and rapidly tremble them while holding his head low, the bill directed at the female, and the occipital plumes just above his back. If a female approaches again, he continues the Understorey Bouncing display. At some point he starts, initially slowly, to rotate his upper body stiffly and, simultaneously, to waggle his increasingly upright head and neck from side to side; he erects his mantle cape, breast shield and head feathering, and raises the occipital plumes to an angle of about 45° and holds them widely apart, only to bring them around on each side of the



Six of the seven Paradisaea *species display communally on leks, but the male* ***Blue Bird-of-paradise*** *is solitary. His displays are performed on a slim branch, or bamboo, grass or vine stem, within 1–3 m of the forest floor, and with foliage directly above. The display involves only one of the three fundamental phases recorded for the other* Paradisaea *species. The perched male lowers himself backwards to hang upside-down, and spreads his flank plumes, with the wings held closed. He looks upwards and starts to call, jerking his head and moving his plumes while his central tail ribbons hang down on each side. His black central abdominal patch becomes oval and expands as he moves his body from the hips.*

[*Paradisaea rudolphi margaritae*, EC New Guinea. Photo: Brian J. Coates]



In the genus Paradisaea, *the communal courtship of lekking males of several species, including the* ***Lesser Bird-of-paradise****, involves three fundamental phases: the Convergence Display; the Static Display; and the Copulatory Sequence. In the Convergence Display, which is unique to lekking species, the dispersed males quickly and noisily return to their lek perches at the approach of a female or females. In the Static Display, the brilliant flank plumes are made more conspicuous by the raising of the wings, followed by a static pose with the plumes raised and the head deeply lowered. While all males hold the same posture, the females have the opportunity to inspect and compare their size and plumage. Up to twelve adult male Lesser Birds-of-paradise may be found in a single lek tree, but most copulations are performed by centrally located males. Strongly skewed mating, whereby a few males perform the vast majority of a species' matings in a season, is documented both for this species and for Raggiana Bird-of-paradise and also, to a lesser extent, for Lawes's Parotia* (Parotia lawesii). *When the mating process diverges from the more random pairing of individuals and includes only a small proportion of the males in the population, there is a significant impact on sexual selection and sexual dimorphism, with a rapid selection of traits exhibited by those males favoured by females.*

[*Paradisaea minor*. Photo: Brian J. Coates]



*The leks of the **Raggiana Bird-of-paradise**, shown here in the Static Display, are located in the upper branches of a canopy tree in the forest interior, or a forest remnant. Occasionally a lek may extend to more than one tree. The lek may hold as many as ten adult males, and may also be shared with Greater Birds-of-paradise* (Paradisaea apoda). *Lek sites may be used for many years in this last species, for more than 20 years in the Raggiana Bird-of-paradise, and possibly up to a century in the Lesser Bird-of-paradise* (P. minor). *Taking five to seven years to reach maturity, these birds live a relatively long time; several species exceed 15 years in the wild.*

[*Paradisaea raggiana*, New Guinea. Photo: Günter Ziesler]

head and finally to project them forward of and above him. He hops, progressively more quickly, up the vertical vine in this stiffly swirling display, and mounts the female for copulation.

During the solitary courtship of the Magnificent Riflebird in north-east Australia, a male, upon sighting a female, initially becomes stiffly sleeked and agitated, sometimes gaping to expose the yellow interior of his mouth. Stretching his head and bill in her direction, he makes small, abrupt side-to-side hops as he sharply flicks his wings and runs his bill down the underside of a wing. As the female approaches more closely, he adopts a sleeked upright bill-up posture, his breast towards her, while sharply jerking his body and/or wings and making his breast shield pulsate. Then, his wings are suddenly outstretched on each side of the body, with a sharp loud rustling sound, as his upward-pointed neck and bill are rhythmically swung back and forth at increasing speed between his wings, which may almost touch each other above his head to form a disc with a central hole. The displaying male raises and lowers himself, at times with a side-to-side rocking motion, and raises and lowers his wings at increasing speed, which produces a loud rustling sound; he cocks his tail to about the horizontal. In this posture he may hop along the perch for a few metres, using a deeply bouncing action, towards and sometimes also backwards away from a female on his perch. As well as facing her, he may also hop along sideways, the wings in alignment with his perch.

The solitary courtship of a male Victoria's Riflebird commences with a Circular Wings and Gape Display directed at a female, the male turning so that he continuously faces her atop his tree stump and accompanying his advertisement calls with wide bill-gaping to expose his yellow mouth. At high intensity the wings meet, or even overlap, above the male's head and are held rigidly still as his mouth gapes, while his tail is cocked to or just above horizontal and his abdomen feathering is raised; now, the only movement involves him in repeatedly, raising and lowering himself slowly and rhythmically on his legs, or turning to follow the moving female, and he does not give any call. When a female arrives on the male's display stump, he initially greets her briefly by leaning back and away in Circular Wings Display, his head and bill hidden behind the leading edge of one wing, after which he holds his raised wings toward the female, their concavity forming a shallow "dish". He then commences the Alternate Wings Clap by sharply raising and fully extending one wing towards the female and slightly closing and lowering the other, hiding his upward-pointing bill behind the leading edge of the raised wing; during this he extends his right leg, to raise that side of his body, while lowering his left. He then suddenly raises his left wing to hit the right one above his head with a thud, and instantaneously swings his upright head and bill across to conceal them behind its leading edge, simultaneously half-closing and lowering his right wing and extending his right leg while lowering his left. This sequence is then repeated numerous times. Display intensifies as the tempo of the male's wing and head movements and associated body-swaying and body-twisting increases until his movements become amazingly rapid; the throat shield appears as a bright shining green or blue vertical line shot with white highlights. He leans progressively towards the female, twisting each wing more and more with each body sway so that they become more horizontal, as does his swinging head. If a female holds her ground, the male advances and adjusts his violently rapid Alternate Wings Clap so that the concave primaries of his wings almost beat the female, which is now "embraced" by each wing alternately. A receptive female rapidly flutters her wings, whereafter the male makes his last sway more extensive so as to hop on to her and copulate.

Initial display activity of the solitary-courting Superb Bird-of-paradise starts when the male adopts a crouched posture with the breast shield sleeked tightly, the cape down against the back, the wings and tail held normally, the head pointed upwards with the eyes fixed on the female, and the narial tufts projecting forwards. This is followed by sudden and repeated upward and outward extension of the breast shield, interspersed with which is a cape-flicking action, whereby the male flicks the closed cape forwards above and over the head with an exaggerated downward movement of the head, thereby presenting the crown to the female. This "flashing" of the breast shield and cape-flicking increase in tempo, bouts of each alternating while the wings and tail retain their normal positions; the erected forecrown feathering reflects white light, and the male may occasionally gape to expose his pale mouth. In high-intensity display, the male thrusts his expanded breast shield forwards, erects the narial tufts, and flicks the cape forwards and spreads it laterally to form a complete concave semi-circle over his head and down each side to below the breast shield. Black cape feathers extend around and inwards to meet the body feathers below the lower breast shield,





The Paradisaea *species have their own variations on the three fundamental display phases, involving additional postures and movements. One of the more complex courtship displays is that of the* ***Greater Bird-of-paradise****. The Convergence Display of this species involves an upright Wing Pose, which begins with one or more males giving rapid "wauk" calls on their lek. The male extends and holds his wings in a rigid position in front of his body for a few seconds, and holds his flank plumes erect over his back, tucks his tail forwards under the perch, and orientates his body perpendicular to the perch. In the Pump Display, often given as a female visitor arrives on the lek, the male's body is lowered and turned almost in alignment with his perch, the wings extended and cupped around it, the flank plumes erected almost vertically, and the head and bill pointed down. In this pose he hops along the perch, bouncing up and down, his vertical motion exaggerated by leg-flexing, and his tail moving rapidly sideways with each bounce. In calls given during the Pump Display, the rapidly repeated "wauk" notes are often run together, as "wa-wa-wa-wa". The Pump phase may be performed prior to the Wing Pose, as the males dash about the lek perches. At the end of the Pump, males perform the Static Display with a Bow, by tipping the body well forwards and down so that the head is below the perch and the back humped; the wings held out and cupped down around the limb; the tail brought forwards and under the limb; and the flank plumes held erect over the back. Display often ends at this point, the males making a few rapid bill-wipes, rising up, and shaking their wings as they lower the flank plumes.*

[*Paradisaea apoda apoda*, Aru Islands, Indonesia. Photos: Loïc Degen]

A summary of breeding seasonality indicates some broad patterns. More breeding occurs during August–January than February–July. But combining various pieces of evidence of breeding for an extensively distributed species can result in the perception of a misleadingly long nesting season, because it includes populations that follow differing cycles according to local conditions, such as peak availability of arthropods and fruit. The ***Red Bird-of-paradise*** *has a very small total range. The males display at least during July and September. On Waigeo, a lek in one gigantic tree in a small forest clearing was attended by up to ten adult males, which displayed on high, defoliated limbs, usually after dawn. The males are most vocal in early mornings and late afternoons*

[*Paradisaea rubra*. Photo: Brian J. Coates]

thus forming a complete, if irregular, ellipse of black relieved only by the iridescent breast shield. The male's eyes can only just be seen below the lower edge of two conspicuous white spots, these being created by light refracted by the elevated forecrown feathers, the black narial tufts and bill bisecting these to form the two white spots; the tail is cocked at about 35–45° and the mouth is closed. In this posture, the male proceeds to dance in short, sharp, deeply bouncing hops around the female, each hop accompanied by an abrupt double flick or flutter of the briefly partly opened wings as the tail is sharply raised, these wing movements causing ticking or clicking sounds.

Courtship by the male Brown Sicklebill involves three display phases. In the Pumping phase, the bird adopts an upright position, with the breast feathers spread, and the tail repeatedly jerked wide open and then shut while the closed wings are moved up and down along the sides, their upward movements coinciding with the tail-opening. In Leaning, the male leans backwards to about 45° and expands his breast feathers, while extending the short flank plumes outwards to form a fringe around the sides; he gives a rattling call and turns the breast upwards, the feet retaining their original position. The breast feathers are now fully spread, making the body look flattened. The modified upper breast feathers are erected around the throat and head so closely that the iridescent black of the face and throat are much enhanced, the beak being held closed; the wings are closely folded, and the tail is slightly spread but not moved; the long pectoral shields are folded beneath the contour plumage, playing no part in this display. The male then leans to one side to rotate the body so that the breast is directed upwards, the breast feathers spread as widely as possible, concealing the tightly closed wings, and the tail partly fanned. Now the third display phase, the Upright, is suddenly started, as the male, without calling, draws its body erect, with the tail slightly opened and the wings still tightly closed. The breast feathers, encircled by the decorative flank plumes, are widely spread, the pectoral shields thrown upwards to extend above the head and wrapping it closely, and the bill widely opened to expose the bright yellow mouth-lining, this position usually being rigidly held for about five seconds. Sometimes the male enhances this display by rotating his body in a series of short jerks, pausing for several seconds between each one, until he is at right angles to the perch, and then jerking slowly in the opposite direction until he has again come to a right angle with the perch and is facing the other way; this may be continued for 2–5 minutes, with no movement of the tail, wings or ornamental plumes, and with no sound uttered.

At the beginning of the solitary courtship of the Buff-tailed Sicklebill, the male suddenly leans backwards to about 50°, giving a convulsive jerk to spread his flank plumes into a perfect disk around the body, and opening his bill for approximately 25 seconds. He holds the upper pectoral fan-plumes behind the head and sloping down across to the front of the body, where they become contiguous with the flank fan-plumes. Returning to upright, he continues singing for several minutes, before dropping back until entirely inverted and then spreading all plumes while vibrating his body for about 30 seconds and perhaps giving a display song.

The solitary court-based courtship of Magnificent Birds-of-paradise involves four display phases. In Back Display, the male turns upside-down on his vertical display perch, with the tail uppermost and the head lifted slightly upwards; he holds this position briefly before he turns the head uppermost. In Breast Display, the breast-shield plumage appears to inflate and deflate as it is raised and lowered, the upper margins of it rising on each side of the head, and undulations of breast feathers send iridescent shimmers across it; iridescent spots in front of the eyes at times become conspicuous. The silent Cape Display is performed if a female moves closer, whereupon the male leans, to as far as horizontal, with the extended neck and bill directed at the female, the cape erect and fully fanned, and the breast shield flattened and elongated, while the tail wires remain in the normal position. This display posture is often maintained by the slightly trembling male for many seconds as the female hops closer down the sapling, and when she is within about 30 cm he may suddenly perform the Dancing Display. In this, he pulls his head and neck



back into his body, puffs and expands most of the plumage, including the pulsating breast shield, lowers his fanned cape, and cocks his tail over the back to present the iridescent upper surface of the central tail wires to the female. He then jerks his head from side to side, opening and closing the bill to expose his mouth coloration, and quivers his tail from side to side as he dances forwards up and then backwards down the sapling with short jerky movements of the body and head that emphasize the yellow cape; during this performance, he emits a peculiar low, rhythmic, hard, clicking, buzzing song with higher and lower notes.

The courtship of the King Bird-of-paradise, which is performed solitarily or enacted co-operatively in twos, involves seven display phases, focusing mainly either on open and vibrating wings or on movements of the pectoral fans and tail wires. A male begins a sequence with the upright Wing-cupping Phase, a brief partial spreading and vibrating of the cupped wings; this is followed by the Dancing Display, in which he holds his body parallel to the perch, the plumage fluffed, and squats low on the perch, spreading and raising his pectoral fans, and cocking his tail so that the central wires reach above his head. He then dances, vibrating his body and shaking his tail wires, while singing a soft song. This display is given when the male is facing away from any female present. The pectoral plumes may be fanned, sometimes to extend higher than the head, and the male may step along his branch to lunge at and strike it with his beak. This Dancing Display lasts for many seconds to several minutes, before he turns around and, still singing in the same pose, briefly performs the Tail Swinging Phase, in which he swings his tail widely from side to side. This typically ends a display, but, if not, the male follows it by spreading both wings out and forwards, with his body parallel to the branch, in the Horizontal Open Wings Display; his wings vibrating, he briefly rocks silently from side to side several times, before suddenly dropping to cling below his perch, in the same pose, and repeating the display. In this latter, the Inverted Phase, he holds his bill open and turns the head from side to side, this inverted display lasting just a few seconds before he closes his wings and tightly sleeks the plumage to hang suspended. He peers around him and then swings several times from side to side like a pendulum, at a steadily increasing tempo, in a brief and silent Pendulum Display. He ends his display by



During the Static Display of the ***Emperor Bird-of-paradise****, the lekking males hang completely inverted and motionless from their perches, for inspection and comparison by the females. The male may perch still and silently upright for a few moments, or suddenly call loudly, before turning under the perch, to hang upside-down with flank plumes expanded, forming a white disc with two central yellow patches. The wings and tail are partly spread, and the head turned upwards. The inverted bird rocks slowly, while twisting from side to side, using his legs as a fulcrum. A female may perch directly above an inverted male to look down at him as he looks up at her. Leks of this species consist of up to six adult males, congregating in one or two adjacent trees within sight of each other. Several males will display synchronously. At one lek, activity was most intense from mid-afternoon, with individuals displaying as low as 3–6 m above ground. The "pop pop" calls of lekking males of this species can be extremely loud, and when delivered rapidly are said to sound like exploding firecrackers. Hybridization of this species with the Lesser* (Paradisaea minor) *and Raggianas* (P. raggiana) *Birds-of-paradise has been recorded. The phenomenon of hybridization within this family is not surprising, given that the promiscuous males of polygynous species show no discrimination in mate choice, but will readily mount almost any female-looking bird that visits their display sites. Presumably, young and naive female birds-of-paradise sometimes mate with males of another species in error, and any female may do so if conspecific mates are not available, as for example, at the geographical or elevational limits of the species' distribution.*

[*Paradisaea guilielmi.* Photos: Brian J. Coates]



*The lek of the **Greater Bird-of-paradise** consists of the larger, exposed horizontal boughs of one or more large spreading trees, immediately beneath the canopy. The lek may contain 15 or more adult males, which defoliate the immediate area of the display perches. Lekking males display both in absence of females and as the females approach the lek. Males in Wing Pose may suddenly turn, bill lowermost, to hop down a perch for a metre or so, and then turn again, bill uppermost, and hop back up to their original position and adopt a static upright Wing Pose, but with the flank plumes erected over the back. This posture is held rigidly, or with only occasional brief wing-fluttering, until the bird again turns, bill lowermost, and hops down the perch again, remaining at the bottom of its descent in inverted pose, with plumes erected in Static Display.*

[*Paradisaea apoda apoda*, Aru Islands, Indonesia. Photo: Loïc Degen]

righting himself atop his perch or by simply dropping down and away from his perch. One copulation followed only an elaborated Dancing Display, the male having his bill open.

The communal courtship of Standardwing Birds-of-paradise involves four display phases. In Convergence Display, one or several males charge about the lek branches, beating their partly opened wings with a rowing-like action and giving rapidly repeated sharp call notes; the breast shield is not utilized and the wing standards are only slightly raised, but this sometimes includes the Wing Pose or, less often, the Wing Standard Display. The Aerial Display is performed by adult males one after another, sometimes in immediate succession. A male, perching upright with the wings closed, and the standards and breast shield relaxed, leans forwards as he stretches his head and neck upwards and opens his breast shield slightly; he calls for 2–4 minutes, with increasing speed and intensity, until leaping vertically upwards by "explosively" extending his legs, and beating his fully open wings in a vertical or nearly vertical ascent flight. At the apex of the flight, he holds his wings fully extended, turns his bill downwards, and "floats" down while rapidly vibrating the conspicuously white primaries, so that they appear as a pale blur at each wingtip. In most descents the tail is closed, but occasionally it is fanned for the latter part of the drop. Males typically return to the perch from which they took off or to an adjacent one. Static Display follows. This consists of the Wing Standard Display, in which the male holds his body rigidly upright and the bill slightly raised as he repeatedly changes the position of the vibrating wings, from only partly opened and slightly lifted out and away from the body, with the carpal joints conspicuously wide apart, to half-open or nearly fully open and with the carpal points held together. The sudden alternating of these two positions causes striking movements of the raised carpal standards. A cracking sound is produced by the sharply clicking mandibles, and a "rowing" motion of the vibrating primaries makes their white tips conspicuous; the crown feathering is raised and lowered, enhancing its iridescent lilac-purple colour, and the upper breast shield is extended so that its two sides meet behind the neck.

Several display phases constitute the solitary courtship of the Twelve-wired Bird-of-paradise. A male initially erects various plumes as he approaches a female that has landed on his vertical display stump; he pecks at her to entice her to perch beneath him, and he then turns the bill downwards to parry at her upward-pointing bill and pursues her in a jerky gait. At some stage, the female flies up over the male on to the perch apex, at which the male turns to face her, bill uppermost, and hops up to her to continue bill-fencing with her. He pulsates his breast shield rhythmically, and conspicuously exposes his pink bare thighs. This scenario may be repeated six or more times, but an additional display phase, the unique Wire-wipe Display, is often performed by the male as the female clings to the side of the perch beneath him. In this, he stops pecking at the female, rotates himself to be aligned head uppermost directly above the female, and performs slow body-swaying movements by hopping so as to alternate his foot positions. During this, he watches the female from over his shoulder as he directs his flank wires to best effect; the body-swaying presents his yellow flank plumes and causes the twelve flank-plume wires to brush across alternate sides of the female's face, neck or breast. Copulation may take place after a brief pursuit or after many pursuits up and down the perch, with or without one or more Wire-wipe Displays. If the female solicits, by flicking or shuddering her outer primaries, the male mounts her to mate.

In the genus *Paradisaea*, the communal courtship of lekking males of the Lesser, Greater, Raggiana, Goldie's and Red Birds-of-paradise involves three fundamental phases, namely the Convergence Display, the Static Display and the Copulatory Sequence. The ritualized Copulatory Sequence remains unknown for lekking Emperor Birds-of-paradise and for solitary-courting Blue Birds-of-paradise, and only the Static Display is recorded for the last-named species. Additional postures and movements are, however, performed by some of these *Paradisaea* species. One of the more complex courtship displays is that of the Greater Bird-of-paradise, which features the above three display phases with some additional postures. The Convergence Display of this species

involves an upright Wing Pose and Pump postures. The upright Wing Pose begins with one or more males giving rapid "wauk" calls on their lek. During this, a male extends and holds his wings in a rigid position in front of his body for a few seconds, and holds his flank plumes erect over the back, tucks his tail forwards under the perch, and orients his body perpendicular to the perch; he may droop or rapidly flap the wings between calling bouts. Males in Wing Pose may suddenly turn, bill lowermost, to hop down a perch for a metre or so, and then turn, bill uppermost, and hop back up to their original point and adopt a static upright Wing Pose, but with the flank plumes erected over the back. This posture is held rigidly, or with only occasional brief wing-fluttering, until suddenly the bird again turns, bill lowermost, and hops down the perch again, remaining at the bottom of its descent in inverted pose, with plumes fully erected in Static Display. In Pump Display, often given as a female visitor arrives on the lek, the male's body is lowered and turned almost in alignment with his perch, the wings extended and cupped around it, the flank plumes erected almost vertically, and the head and bill pointed down; in this pose he hops along the perch, giving the pump call while bouncing up and down, his vertical motion exaggerated by leg-flexing and his tail moved rapidly sideways with each bounce. The Pump phase may be performed prior to the Wing Pose, as males dash about lek perches and/or between these. At the end of the Pump, males perform the Static Display with a Bow, by tipping the body far forwards and down so that the head is below the perch and the back humped, the wings being held out and cupped down around the limb, the tail brought forwards and under the limb, and the flank plumes held erect over the back; the bird may give a "baa" call while in this position. Display often ends at this point, the males making a few rapid bill-wipes, rising up, and shaking their wings as they lower the flank plumes. The Copulatory Sequence dance phase usually starts from the Bow when a female is perched directly above the inverted male, often touching his tail wires. He quickly turns upwards to face her and starts rhythmically bouncing and shufflling back and forth or up and down along the limb, his flexing legs exaggerating the vertical motion. The "click" call is given with the slow and rhythmic movement of this. When immediately beneath or beside the female, he hops or bounces on the spot and claps the female between his open cupped wings as he bills her nape and/or bill while swaying from side to side, all at an increasing tempo, prior to suddenly hopping up to mount and copulate.

During the courtship of the Blue Bird-of-paradise, the male, from a normal perched position, lowers himself backwards so as to hang upside-down and spreads his flank plumes, with the wings held closed. He looks upwards and starts to call, and he jerks his head and moves his plumes while his central tail ribbons hang down on each side. His black central abdominal patch becomes oval and expands as he rhythmically moves his body from the hips. As the display progresses, his eyes close, leaving only slits, and the white patches above and below them become enlarged. If a female is now on his perch, he twists his head and body towards her to direct as much as possible of his nuptial plumage at her; his black abdomen patch may change in shape from a longer oval to a shorter one, or vice versa. If the female holds her ground, he then stiffly draws his body upwards by his legs, and raises it upwards and forwards towards the female as the black abdomen patch becomes more ovate, while his head and bill point directly up the centre of his body, and the central tail ribbons may or may not be rapidly swung side to side. Copulation is achieved when the inverted male suddenly regains a normal upright perching position beside the female, by lifting himself forwards head first, and returning his plumage to the normal position; the female turns away from him, with head held downward, and solicits by flicking her tail several times, before the male mounts her.

Strongly skewed mating, whereby a few males perform the vast majority of a species' matings in a season, is documented for the Lesser and Raggiana Birds-of-paradise and also, to a lesser extent, Lawes's Parotia. When the mating process diverges from the random pairing of individuals and, instead, includes only a small proportion of the males in the population, this has a significant impact on sexual selection and sexual dimorphism. It results in a rapid selection of traits exhibited by those males favoured by females. In the case of the Magnificent Bird-of-paradise, the ratio of court-holding males to females is strongly skewed in favour of females, but the sex ratio across an entire local population is nevertheless 1:1. Thus, the functional sex ratio in such species is skewed as a product of their mating system, largely because of the high proportion of immature males wearing female-like plumage, as found in any population of polygynous, sexually dimorphic bird species.

Major gaps exist in our knowledge of basic bird-of-paradise nesting biology. Nothing is known of the monotypic genus *Loboparadisea*, little is known of the *Manucodia* species, and little information other than nest and egg descriptions is available for the genera *Lycocorax*, *Parotia*, *Epimachus*, *Semioptera* and *Seleucidis*. Moreover, there are no details at all of the breeding of ten species, including some of those longest known to western science, examples being the Arfak Astrapia (*Astrapia nigra*), the Black Sicklebill and Wilson's Bird-of-paradise. For 17 of those species for which some knowledge is available, this is limited to descriptions of nests and eggs. Despite these limitations, however, great advances have been made in the past three decades, in part as a result of studies of breeding captives.

Several interrelated factors are potentially relevant to the nesting ecology of birds-of-paradise. These include their small clutch sizes, the cryptic nature of their nests, potential nest-content predation, the need to provision nestlings efficiently, and the fact that, with most species, only the females attend the nest. Only the manucodes and probably, albeit as yet unconfirmed, the Paradise Crow provide biparental care at the nest. For the remaining, polygnous, species, it is the responsibility of the female alone to build the nest, incubate the eggs, brood the chicks and provision the nestlings until they reach independence.

All members of the family whose nests are known are solitary nesters, and it is unlikely that any paradisaeid species nests gregariously, colonially, or with the involvement of individuals additional to the parents or parent and acting as helpers. The known nests of the cnemophilines are built in relatively exposed terrestrial or low-vegetation sites and are highly cryptic, the moss and fern materials matching the nest-site vegetation. Those of the Paradisaeinae are built in tree branches with the exception of that of the King Bird-of-paradise, a single nest of which was found within a tree crevice. Some riflebirds and the Superb and the



In the genus Paradisaea, *the first indication that an individual is a male is when an annual moult produces central rectrices longer than the other tail feathers. In subsequent moults the young male, like this* ***Greater Bird-of-paradise****, also acquires a densely feathered, darker breast "cushion", and short flank plumes. With each subsequent year the flank plumes are longer, until finally reaching adult proportions. The remarkably long period spent in cryptic female-like plumage may be a response to severe competition among promiscuous males for access to females. It might also reflect an evolutionary strategy that permits young males to approach adult males, to visit their courting sites, and perhaps even to fertilize some of their female visitors.*

[*Paradisaea apoda apoda*, Aru Islands, Indonesia. Photo: Loïc Degen]



*The solitary male **Wilson's Bird-of-paradise** holds a court up to a metre wide, usually in dense forest, and preferably in a small well-lit clearing around a fallen tree or landslide. The male keeps the court clean of litter, and removes leaves from sapling display stems growing within the court. The male initially responds to a female-plumaged visitor with a "frozen" posture on the base of a vertical sapling. The male's display involves static and leaning postures and dance, with movements of the nuchal cape, pectoral shield, head and central rectrices, and gaping to show the bright yellow to green mouth. During the display, the male emits complex, squeaky twitterings in a subsong punctuated with guttural burring notes. Several other postures and movements have been observed, and some elements are similar to those of the congeneric Magnificent Bird-of-paradise* (Cicinnurus magnificus), *but the complete, successful courtship of this species is apparently undocumented. There is no other information on breeding in this species, even though it was one of the first paradisaeids known to science. The contrast between the bright blue bare skin on the male's crown and the darker skin of the female's can clearly be seen here.*

[*Cicinnurus respublica*, Batanta Island, Indonesia. Photo: Tim Laman]



As the female approaches, this male ***Magnificent Bird-of-paradise*** *has begun his Cape Display, leaning to the horizontal, with his cape erect and fully fanned, and his breast shield flattened. The male holds this position, trembling and silent, while the female approaches. Across the large range of this species, displays may be performed throughout the year, but mostly between July and February. The immature male is like the adult female, but with a blackish-brown, rather than pale blue, bill. Older birds in female-type plumage develop narrow, pointed central rectrices which increase in length with each moult, prior to acquiring the wire-like sickles of the adult male. Full adult plumage is not acquired until at least six years old. Females acquire their adult appearance within a year of fledging, and may commence breeding when only a year or two old. As a result of this "heterochrony" (unequal development of the sexes over time), the ratio of court-holding males to females in the Magnificent Bird-of-paradise is strongly skewed in favour of females, even though the sex ratio across an entire local population is 1:1.*

[*Cicinnurus magnificus*, Arfak Mountains, New Guinea. Photo: Tim Laman]



*When a female arrives on the display stump of a male **Victoria's Riflebird**, he greets her by leaning back and away in Circular Wings Display, his head and bill hidden behind the leading edge of one wing, after which he holds his raised wings toward the female, their concavity forming a shallow "dish". He commences the Alternate Wings Clap by raising his left wing to hit the right one above his head with a thud, and swings his upright head and bill across to conceal them behind the wing's leading edge. The sequence is repeated at a rapidly increasing tempo. If a female holds her ground, the male advances and adjusts his rapid Alternate Wings Clap so that the concave primaries almost beat the female, which is now "embraced" by each wing alternately.*

[*Ptiloris victoriae*, Atherton Tableland, NE Queensland, Australia. Photo: Stanley Breeden/ Lochman Transparencies]

Twelve-wired Birds-of-paradise frequently nest in pandanus (*Pandanus*), in palms (Arecaceae) or in plants of similar structure. Most nests of the Trumpet Manucode, the Short-tailed Paradigalla, the Ribbon-tailed Astrapia and Victoria's Riflebird are built in the densely foliaged small crown of a sapling, pandanus or other plant typically growing within a small forest gap having sky, not foliage, directly above. Thus, they are placed out of the way of arboreal pathways for climbing predators.

A nesting association apparently exists between pairs of Trumpet Manucodes and Black Butcherbirds (*Cracticus quoyi*) in rainforests in Cape York Peninsula, in north-east Australia. The assumption is that the manucodes situate their nests adjacent to these pugnacious and predacious butcherbirds, which are efficient nest predators, in order to gain some protective advantage, but this, as well as the manucode's ability to prevent the butcherbirds from preying on its own nest, remains to be demonstrated and studied.

Females of Loria's Bird-of-paradise, the Short-tailed Paradigalla, the Ribbon-tailed Astrapia and the Paradise and Victoria's Riflebirds not uncommonly build a nest upon, immediately adjacent to or near their nest of the previous season or seasons. Thus, some females nest in consecutive years at the same site, which becomes known as a traditional site. This raises the possibility that such females may mate with the same male over several years, and some female Lawes's Parotias have already been found to do so over two seasons. Unfortunately, no detailed observations of the nest-building process of any paradisaeid species have been made.

Nests are constructed in three different forms, being domed, or a suspended shallow open cup, or a supported bulky open cup. Known cnemophiline nests are domed structures of orchid stems with a lush moss and fern exterior, and with a few short sticks haphazardly incorporated into the foundation. Other than this instance of the use of sticks, by a group now considered by many not to be members of the Paradisaeidae (see Systematics), the birds-of-paradise, unlike the bowerbirds, do not incorporate sticks into their nests. There is a clear dichotomy in type of basic nest structure within the paradisaeines. The manucodes construct a sparse, relatively shallow, open cup predominantly of vine tendrils, sometimes including leaves and pieces of rotten wood in the egg-chamber, suspending this in a horizontal forking branch; Paradise Crow nests are similar but bulkier, with numerous dry wood chips between the lining and the outer vine tendrils. In contrast, all other known paradisaeine nests are deep, dense, bulky, entirely stickless open bowl-shaped structures, supported below by vertically forked branches, and are composed of orchid stems, leaves, mosses and ferns. This nest type rarely includes wood debris in the egg-chamber and is remarkably constant across genera.

Female Victoria's and Paradise Riflebirds typically decorate the rim of the nest with sloughed snakeskin, and it is suggested that this may deter some potential predators. Although no direct evidence exists, females Lawes's Parotias may ingest some of the items that the male uses to decorate its terrestrial court, such as chalk, for their mineral and calcium content, and they may also use snakeskin as female riflebirds do.

Bird-of-paradise clutches are typically of one or two eggs and rarely of three eggs, but for most members of the family there are few data on this aspect of reproduction. Clutches containing two eggs are typical of monogamous manucodes, which do, rarely, lay three-egg clutches. A clutch of only one or two eggs is more to be expected in the polygynous species, because, with male emancipation, only the female is available to incubate the eggs and to provision the young; three-egg clutches do, however, occur on rare occasions among some lowland polygynous species, such as the riflebirds. Known clutches of highland species are of a single egg and, while this may reflect colder climates and therefore sparser animal-prey availability, numerous other factors, including latitude, length of daylight, habitat type, diet, body size, parent age, egg size, nest-site and nest type, and social structure of the nesting birds, may influence the evolution of clutch size. Eggs of most multi-egg clutches are laid on consecutive days.

Eggs of paradisaeids are typically elliptical ovate, or a long oval, in shape, the odd one tending towards oblong oval, or elliptical. The few known eggs of the Cnemophilinae are pale pinkish, most markings consisting of reddish-brown fine spotting, predominantly around the larger end. In the Paradisaeinae,



The four phases of the terrestrial courtship of ***Lawes's Parotia*** *start with the male clearing debris from his court with his bill at an ever-increasing rate, his movements becoming more ritualized until he is no longer picking anything up. Suddenly, he performs a brief Initial Display Bow as he brings the black frontal crest feathers forwards and above the narial tufts. He then flicks his wings slightly out from the body to free his flank plumes. He stretches his body fully upwards on extended legs as his "skirt" is raised and spread. His three wire-like occipital plumes are raised, separated and brought above his head to project forwards, while he shakes his head from side to side. He commences his Ballerina Pose dance, moving sideways in a semi-circle, with minute, mincing steps. The male Lawes's Parotia decorates his court with sloughed snakeskin, mammal dung, chalk, fur, feathers and bone. He may steal decorations from neighbouring courts, which in the exploded lekking system found in this species, may be as close as 15 m away, in full view. Neighbouring males disrupt each other's courtship. The decorations are not used in the display, but removed by females throughout the nesting season. The females may ingest some of the decorative items, such as chalk, for their mineral content. They may also decorate the rims of their nests with sloughed snakeskin, as female riflebirds* (Ptiloris) *do. The number and quality of these items may provide information about relative male fitness, in the same way as bower decorations do for the bowerbirds (Ptilonorhynchidae). Some females show fidelity to a particular male, returning to mate with him year after year.*

[*Parotia lawesii*,
New Guinea.
Photo: Günter Ziesler]

manucode eggs vary from whitish and pinkish to buff, variably heavily spotted to blotched with browns to black throughout, but more densely so at the larger end, whereas the buff to beige egg of the Paradise Crow is unique in being more pointed at the small end and is scrawled and scribbled throughout with swirling fine blackish lines or vermiculations. Of the remaining paradisaeine species, paradigalla eggs are like the spotted, rather than blotched, eggs of manucodes, and those of astrapias may be similar but are more usually marked with longer broad blotches, these tending to become more elongated down the egg length. In all other genera the eggs vary in ground colour, but all typically have broad brushstroke-like elongate markings down their length.

Incubation periods have been documented for only some of the members of this family, all of them polygynous species, and these span 14–27 days. Notwithstanding such variables as uniparental versus biparental nestling care, nest type, and diets ranging from exclusively frugivorous, as with *Cnemophilus*, through mixed, to one consisting predominantly of arthropods, a general correlation between increasing altitude and longer incubation periods is apparent. Both sexes of monogamous species are presumed to incubate, but this is confirmed only for the Trumpet Manucode. In all observed polygynous species only the female incubates. Birds species in general typically spend 60–80% of each day in incubating, this being true both of species in which only females incubate and of those in which both sexes do so, and the six paradisaeid species for which relevant information is available fit this pattern.

A striking characteristic of bird-of-paradise hatchlings is that they are naked or have only the sparsest of down, their dorsal skin being already pigmented dark blue-grey to blackish-grey or else becoming so within a few days. On hatching, paradigallas have well-developed facial and mandibular wattles, typical features of the adults. Nestlings and juveniles of the relatively long-billed genera *Ptiloris*, *Seleucidis*, *Epimachus* and *Lophorina* have a shorter, broader and blunter bill that grows longer, narrower and finer as they mature. It is not known if this implies that the young of such species are dependent on the parent for speciality foods for a longer period than are short-billed species.

Nestling periods vary from 14 days to more than 30 days, and they are, as with incubation, generally longer for higher-altitude species than they are for lowland ones. For the few species studied, the nestling growth rate indicates that the eyes first open when the chick is about six days old. At about 8–10 days the contour feathers of *Paradisaea* nestlings just burst from the pin tips, and the primary coverts and primaries burst from pin at about two weeks of age. Growth curves for nestling birds-of-paradise in the wild show that the larger species grow at a fast rate, and also that all such curves are virtually linear over much of their length, except for the downturn just prior to the chicks' departure from the nest. Nestlings regularly lose some weight at this time because of the energetic cost of rapid growth of the tail feathers and flight-feathers.

The few measures of the percentage of daily time that wild-living females spend in brooding a single nestling varies from about 14% to 48%. The Crested Bird-of-paradise, which builds a domed nest, devotes far less time to the brooding of the young, this suggesting that the more cryptic, protective and presumably better-insulated nest enables a parent to be less attentive, notwithstanding a relatively cold habitat.

The rate at which single-nestling broods of polygynous species are fed by the female parent has been recorded for five species, and it, too, varies, from about one to three meals per hour. Of these five paradisaeids, the Crested Bird-of-paradise has by far the highest feeding rate, doubtless a reflection of this species' low-protein nestling diet, which consists exclusively of fruit. A pair of nesting Trumpet Manucodes, observed during four days as it provisioned the brood of two nestlings, made an average of 3·4 feeding visits per hour.

Parents feed their nestlings by regurgitating fruit and/or animal items (see Food and Feeding). The only exception to this is that some species will carry in the bill the last item gathered, this being the first item to be offered to the young, usually in the form of animal prey. In all species for which nest-sanitation behaviour



While males maximize the time at their courts, to attract and mate with as many females as possible, females range more widely, being restricted to a single location only when nesting. Recent research has revealed the courtship of ***Carola's Parotia*** *to be as complex as that of any other avian species, involving 58 distinct elements. The male performs a Hopping-on-the-spot display on a court perch as the females approach. Some courtship elements are similar to those described for Lawes's Parotia* (Parotia lawesii)*, including the Ballerina Display, although some which feature the white area of flank plumes and fine detail of the elaborate head plumage are not found in other adult male pariotias.*

[*Parotia carolae clelandiae*, Crater Mountain, New Guinea. Photo: Tim Laman]



*The courtship of **Goldie's Bird-of-paradise** involves the same three display phases as for other* Paradisaea *species, with additional postures and movements. This is the inverted Static Display. A lek of this species on Fergusson Island, in the D'Entrecasteaux Islands, consisted of four main trees. Eight to ten males used this lek, usually two to a tree, but no more than two females and six unplumed males were seen at any one time. The advertisement calls of lekking males include "wok-wok" or "wark", usually given in the absence of females. A soft "whick-whick" is possibly a male-to-male contact call, but a loud, liquid, ringing version of this is given when a female is on the lek.*

[*Paradisaea decora*, Fergusson Island, New Guinea. Photo: Tim Laman]

has been noted, the parent or parents swallow the nestlings' faeces throughout all or most of the nestling period. Only when the young are near the time when they will leave the nest do their parents carry faeces and seeds away from the nest.

Some parents do perform a distraction display and aggressive nest defence, but documented instances of this are few. During intensive observation of nesting females of Loria's Bird-of-paradise, the Crested Bird-of-paradise, the Short-tailed Paradigalla, the Ribbon-tailed Astrapia and Victoria's Riflebird, instances of mobbing, distraction or other active anti-predator behaviour were rarely seen. Incubating or brooding females will chase away conspecifics that venture into even the more general nest area, and an anti-predator freezing posture has been recorded for Victoria's Riflebird and the Raggiana Bird-of-paradise, females of which simply freeze on a perch at the sight or sound of a potential predator. Clearly, some birds-of-paradise do, however, perform a distraction display and aggressive nest defence, as exemplified by a captive female King Bird-of-paradise that both vigorously distracted and physically attacked its human owner while nesting, but not at other times.

Little is known about the care of dependent young once they have left the nest. A female Short-tailed Paradigalla was seen to



*The Copulatory Sequence dance phase of the **Greater Bird-of-paradise** usually follows the Wing Pose–Pump–Bow sequence. It starts when a female is perched directly above the inverted male, often touching his tail wires. He quickly turns upwards to face her, and starts slowly and rhythmically bouncing and shuffling back and forth along the limb, his flexing legs exaggerating the vertical motion. During the dance display, the male Greater Bird-of-paradise produces a slow rhythmic "click" in time with his movements, and sometimes also a faint nasal "bonk" as the wings are raised for a dance step.*

[*Paradisaea apoda apoda*, Aru Islands, Indonesia. Photo: Loïc Degen]



*A successful high-intensity display is concluded when the male **Lawes's Parotia** lunges across his court, with plumage sleeked and head thrust forwards and horizontal to the ground, before hopping up on to a court perch to copulate. The courtship of the congeneric Wahnes's Parotia* (Parotia wahnesi) *is highly complex, involving eleven diagnosable behaviour patterns, including some of up to 46 elements, within a highly structured framework. The basic display pattern is similar to that of Lawes's Parotia. It differs mainly in that little court-clearing precedes it; there is no crest to extend forwards to cover the narial tuft; the occipital plumes are thrown forwards before the bird stands erect; and it uses its tail and wings when crouched.*

[*Parotia lawesii*, New Guinea. Photo: Günter Ziesler]

feed an immature of her own size, but with duller plumage and less pure yellow facial wattles, for 108 days, but she apparently ceased doing so a week later. A young Victoria's Riflebird was fed by a female 74 days after leaving the nest. In captivity, young of the Greater Bird-of-paradise began to feed independently of the adults at 29–32 days.

There is one documented case of a Common Koel (*Eudynamys scolopacea*) laying an egg in an active nest of Victoria's Riflebird. This appears, however, to be the only known instance of nest parasitism being suffered by any member of the bird-of-paradise family.

Movements

It has been claimed that Trumpet Manucodes migrate between south-eastern New Guinea and north-eastern Australia, but there is no evidence of this and indeed different races occupy the two areas, so the claim is clearly without foundation. Most species do, in fact, appear to be sedentary forest-dwellers, with permanently fixed home ranges. The species that are primarily insectivorous have small home ranges which seem, in the case of adult males, to be exclusive foraging areas, whereas the mainly frugivorous ones appear to occupy larger, non-exclusive home ranges.



*After a male **Victoria's Riflebird** has begun to "embrace" a female during the latter stages of his Alternate Wings Clap, a receptive female will rapidly flutter her wings, whereupon the male makes his last sway more extensive, so as to hop on to her and copulate. Detail of the sequence of the display prior to mating in the Paradise Riflebird* (Ptiloris paradiseus) *is lacking, but the courtship is much as for Victoria's Riflebird. In the Magnificent Riflebird* (P. magnificus), *the male displays with initially static sleeked postures, then raises his fully opened wings high to each side, swinging his head and neck between them.*

[*Ptiloris victoriae*, Mount Lewis, NE Queensland, Australia. Photo: Hans & Judy Beste/ Lochman Transparencies]





When the Copulatory Sequence dance has brought him to a position immediately beneath or beside the female, the male ***Greater Bird-of-paradise*** *hops or bounces on the spot and claps the female between his open cupped wings. He strokes her nape, and sometimes also her bill, with his bill, while swaying from side to side, all at an increasing tempo, prior to suddenly hopping up to mount and copulate. Females tend to choose to mate with centrally located males, which are older and more dominant. Copulating pairs are thus "protected" by peripheral, subdominant and younger males, which are more exposed to predation. As well as providing females with the opportunity to choose the "best" male, communal display systems promote competitive interaction among males. Older, more dominant males tend to control the social structure of the lek, and displace immature males from the central part, if not from the entire lek. Once the hierarchy is established, aggression is reduced, and females can visit without excessive harassment by unruly males. More males are found at established than at new leks, and younger and subordinate males gain the benefit of associating with more experienced conspecifics, as well as occasional opportunities to mate with females attracted by the dominant birds.*

[*Paradisaea apoda apoda*, Aru Islands, Indonesia. Photos: Loïc Degen]



The five sexually monomorphic manucode species and the Paradise Crow (Lycocorax pyrrhopterus) *are known or presumed to reproduce as socially monogamous pairs, with at least some of the tasks of brood care shared by both parents. In the remaining, polygnous, species, it is the female alone that builds the nest, incubates the eggs, and broods and feeds the chicks. The nests of the* ***Curl-crested Manucode*** *and other congeners are open, loose, cup-shaped structures of vinelets and twigs, sometimes with a base of large leaves, and sometimes including leaves and pieces of rotten wood in the cup. The nests are suspended from the fork of a horizontal branch.*

[*Manucodia comrii comrii*, Dobu Island, New Guinea. Photo: Tim Laman]

Limited data suggest that the numbers of Crested Birds-of-paradise found above 2600 m on Mount Giluwe, in eastern New Guinea, increased during the dry season, when the birds moved to their upper altitudinal limit. In Australia, Paradise Riflebirds are seldom seen below 200 m except in the winter months, when individuals may be found at sea-level; males are probably territorial only to the extent of defending their display sites. In the non-breeding season, this species may move from subtropical and temperate rainforests, and wet sclerophyll forest adjacent to rainforest, into dry sclerophyll forest to more than 1 km from rainforest. Most adult male Victoria's Riflebirds are sedentary, but during the austral winter some individuals, which may form temporary feeding aggregations, may move out of rainforest into adjacent wet sclerophyll woodlands, and typically frequent the ecotone to the west of the Great Dividing Range rainforests. Other than these observations, the members of this family are best considered sedentary.

Relationship with Man

For millennia, birds-of-paradise have provided a focus for myth, ceremony, dress and dance for peoples in New Guinea and neighbouring islands. Myths and rituals associated with these birds,



Unlike the typical birds-of-paradise, the three cnemophilines build a globular, domed nest with a side entrance hole. Externally the nest of the ***Crested Bird-of-paradise*** *consists of green mosses and fern fronds, placed on a foundation of woody sticks, 2–4 m above the ground in a mossy tree; typical birds-of-paradise do not use sticks in nest-building. In this species, and possibly all three cnemophilines, the parent female and her offspring eat only simple fruits. Also unlike the typical paradisaeids, both* Cnemophilus *species have a distinct juvenile plumage.*

[*Cnemophilus macgregorii*, Tari Gap, New Guinea. Photo: Clifford & Dawn Frith]



*The nest of the **Magnificent Riflebird** is composed of large dead leaves and vine tendrils loosely put together, and lined with fine leaf midribs and fibres. The clutch is one or, usually, two eggs. A clutch of only one or two eggs is more to be expected in the polygynous species, because only the female is available to incubate the eggs and provision the young. Clutches containing two or sometimes three eggs are typical of monogamous manucodes. Known clutches of highland species are of a single egg, which may reflect colder climates and sparser animal prey availability.*

[*Ptiloris magnificus alberti*, Cape York Peninsula, Queensland, Australia. Photo: Clifford & Dawn Frith]

presumably created thousands of years ago, persist today. For example, Papuan men may perform rituals or speak incantations prior to and during the hunting of birds-of-paradise in order to keep themselves safe and to make their efforts successful. Adult male birds-of-paradise are traditionally hunted for their nuptial plumes, which are worn as part of traditional dress and, particularly, during ceremonies and festivals. The trade in plumes of the adult males has for a long time been important both locally and, during more recent centuries, over an ever-wider area.

The carefully accumulated skins of plumed and long-tailed adult male birds-of-paradise hunted or traded by initiated men were placed between the flattened broad or woven fronds of a palm or pandanus tree, within a length of bamboo tube, or in another such safe storage. These were then placed among the smoky rafters of the men's house, safe from destructive insects, light and damp, the eyes of women, and the reach of children. The brilliant hues and delicate structures of these treasured plumes were exposed to light and the elements only during important cultural events, including sing-sings. A sing-sing is the New Guinean equivalent of a festive social gathering of the community, and it enables all to exhibit wealth, in the form of personal adornment, and to show their social status, dancing prowess, demonstrating their physical vigour and skill, musical ability, wit and other valued social graces. Such gatherings provide a forum



*This female **Ribbon-tailed Astrapia** sitting on her nest is most unusual in that her central tail feathers are greatly elongated, narrow and white, just like those of adult males. There appear to be no other records of female Ribbon-tails with such exceptionally male-like tails. One possible explanation of such an unusual case is that this is a very old female: it is a recognized phenomenon among species that show marked sexual dimorphism that a few old females can acquire traits of the male.*

[*Astrapia mayeri*, New Guinea. Photo: Clifford & Dawn Frith]



The Glossy-mantled (Manucodia ater) *and* ***Trumpet Manucodes*** *maintain year-round pair-bonds, both sexes attending the nest and provisioning the offspring. The nest of the Trumpet Manucode is an open, basin-shaped structure of vine tendrils; the eggs can be clearly seen here through the nest wall. A nesting association apparently exists between Trumpet Manucodes and Black Butcherbirds* (Cracticus quoyi) *in rainforest on the Cape York Peninsula of north-eastern Australia. It is assumed that the manucodes gain some protective advantage from these birds.*

[*Manucodia keraudrenii gouldii*, Iron Range, Cape York Peninsula, Queensland, Australia. Photo: Clifford & Dawn Frith]

for bachelors to exhibit their hoard of plumes, or their access to such a hoard. These may be owned by a bachelor, may be loaned to him by relatives or friends, or may be hired in exchange for goods or return favours, and so on. As a result of widespread plume-trading within New Guinea, a man can wear the plumes of species not found near his home. Men adorn themselves with plumes, at least in part, because they relate closely to the masculinity and vigour of courting male birds-of-paradise.

Papuan aesthetic values, as with fashion anywhere, vary from place to place and over time, and so, too, does the use of plumes of the various species. To this day, adult male bird-of-paradise skins feature conspicuously in the economy of Papuan people, particularly among highlanders. They were, and remain, part of many a "bride price" that men must pay to a future wife's family. Thus, given that people have lived in New Guinea for as long as some 50,000 years, plume-trading may have been practised on the island over tens of thousands of years.

Dried "trade skins" of adult male birds-of-paradise, particularly those species in the genera *Cicinnurus* and *Paradisaea*, have probably been traded from New Guinea to what is now the eastern Indonesian archipelago, the Philippines and the South-east Asian mainland for as long as 5000 years. Certainly, they were valued items in Asia more than 2000 years ago. The earliest voyagers to reach New Guinea were the first to report the birds-of-



The diet of ***Victoria's Riflebird*** *nestlings is up to 80–90% animal items, and the rest fruit. At first, nestlings of most species are fed with arthropods, which provide calcium for bone formation, structural proteins for tissue growth, and lipids for energy. After the chicks reach a certain age, they are fed mainly with fruit. Once nestlings reach a certain size, a range of fruits can probably meet their dietary needs. It is probable that in polygynous species, the adults have different foraging demands. Females require more arthropods while nesting, while males seek foods such as fruit that minimize foraging time, allowing them to maximize time at display sites.*

[*Ptiloris victoriae*, Atherton Tableland, NE Queensland, Australia. Photo: Clifford & Dawn Frith]



*The known nests of the cnemophilines like the **Crested Bird-of-paradise** are built in relatively exposed terrestrial or low-vegetation sites, and are highly cryptic, the moss and fern materials matching the nest-site vegetation. The few known eggs of the Cnemophilinae are pale pinkish, most markings consisting of fine reddish-brown spotting, predominantly around the larger end. Eggs of paradisaeids are typically elliptical ovate, or a long oval, in shape. Incubation periods have been documented for only some of the members of this family, all of them polygynous species; they span 14–27 days. A general correlation between increasing altitude and longer incubation periods is apparent. The clutch of the Crested Bird-of-paradise, which is a bird of upper montane and subalpine forest at 2100–3650 m, is probably one egg, and the incubation period more than 19 days. Nestling periods vary from 14 to more than 30 days, and they are, as with incubation, generally longer for higher-altitude species than for lowland ones. The nestling period for the Crested Bird-of-paradise is more than 30 days. The few measures of the percentage of daily time that wild living females spend in brooding a single nestling vary from about 14% to 48%. The Crested Bird-of-paradise devotes far less time to brooding than some other species, suggesting that the more cryptic, protective and presumably better-insulated nest enables the parent to be less attentive, despite the relatively cold habitat. The rate at which single-nestling broods are fed has been recorded for five polygynous species, varying from about one to three meals per hour. The Crested Bird-of-paradise has by far the highest feeding rate, doubtless a reflection of its low-protein nestling diet, which consists exclusively of fruit.*

[*Cnemophilus macgregorii macgregorii*, Tari Gap, New Guinea. Photo: Clifford & Dawn Frith]



Parents feed their nestlings by regurgitating fruit and animal items, although some species will carry in the bill the first item to be offered to the young, usually an item of animal prey. The nestling period for the single chick at one ***Short-tailed Paradigalla*** *nest was 25 days. On hatching, paradigallas have well-developed facial and mandibular wattles, like the adults. In the few species studied, the eyes open at about six days old; at about eight to ten days, the contour feathers burst from the pin tips, and the primary coverts and primaries burst from pin at about two weeks. One female Short-tailed Paradigalla removed and ate the nestling's faeces; this behaviour has been noted in all species in which nest-sanitation has been studied.*

[*Paradigalla brevicauda*, Tari Gap, New Guinea. Photo: Clifford & Dawn Frith]

paradise and the relationship between them and the Papuan peoples to the wider world. Spanish and Portuguese sailors who brought the first, legless trade skins to Europe in the 1520s recited the story that the birds never land on a firm surface, but float in the air until death. This myth persisted until the end of the sixteenth century. During the early 1600s, complete skins arrived in Europe and confirmed that birds-of-paradise were, after all, typical, if splendid, birds having crow-like feet. During the period 1600–1825, much was written about birds-of-paradise, while precious little was actually known of them. A dozen or so additional species were described from skins reaching Europe, and others were named that subsequently proved to be invalid species, being interspecific hybrids (see Systematics).

All of this stimulated interest in the exploration of the Moluccan Islands, New Guinea and Australia in search of new birds during the first half of the nineteenth century. By the end of that century, growing scientific and public interest resulted in considerable demand for specimens for museums and the millinery trade. During the first decade of the twentieth century, hundreds of thousands of bird-of-paradise skins were exported from New Guinea, as many as 80,000 a year reaching Europe. As the millinery trade declined, in the early twentieth century, a socially restricted worldwide clientele clamoured to obtain live birds-of-paradise for personal, royal or public collections, while small numbers had previously been kept in captivity for some 200 years.

The hunting of birds and other wildlife remains very much a part of the life of many Papuans today. Hunting techniques are inevitably moving quickly away from the traditional, to the use of shotguns, and the plume component of bride prices has diminished. Traditional trade and exchange of birds-of-paradise is still widespread in New Guinea, but commercial trade is now illegal. In remote villages, close affiliations with these birds persist even in the twenty-first century. Today, traditional affinities with the birds have been commercialized: stylized birds-of-paradise adorn national flags, national-airline aircraft, bank notes and coins, postage stamps, beer cans and glasses, packets of coffee, and many other products. The national emblem of Papua New Guinea is a stylized displaying adult male Raggiana Bird-of-paradise perched on a kundu drum and spear.

Status and Conservation

The ever-increasing slaughter of wild birds, as indicated by the importation into Europe and North America of vast numbers of dried skins for the millinery trade (see Relationship with Man), fortunately led to legislation banning it, and the bird-conservation movement was thus born. Since 1924, the birds-of-paradise have been protected from commercial exploitation throughout their range, and they are now formally protected by national laws and by international convention, including fauna acts in Papua New Guinea, Australia and Indonesia, and the Convention on the International Trade of Endangered Species, or CITES, worldwide. In the modern world, however, the exponentially growing human populations and associated resource development, and the fact

Typical birds-of-paradise do not have a distinct juvenile plumage as the cnemophilines do. Juvenile and immature birds are generally smaller than the subadults and adults of the same species. The juvenile ***Black Sicklebill*** *is like the adult female, but with the crown and upperparts more rust-red, and the plumage soft and downy below. The nestlings and juveniles of the* Epimachus *sicklebills and some other relatively long billed genera have a shorter, broader and blunter bill that grows longer, narrower and finer as they mature.*

[*Epimachus fastosus*, Tari Gap, New Guinea. Photo: Clifford & Dawn Frith]





Little is known about the care of dependent young once they have left the nest, which in the ***Ribbon-tailed Astrapia*** *takes place at 25–29 days. This female is feeding a young male, possibly about four months old, which already shows a fairly elongated tail. In captivity, the young of the Greater Bird-of-paradise* (Paradisaea apoda) *began to feed independently of the adults at 29–32 days. Young birds may remain at least partly dependent for much longer than this. A female Short-tailed Paradigalla* (Paradigalla brevicauda) *was seen to feed an immature of her own size, but with duller plumage and less pure yellow facial wattles, for 108 days. A young Victoria's Riflebird* (Ptiloris victoriae) *was fed by a female 74 days after leaving the nest. In July, in the Arfak Mountains, a female-plumaged Arfak Astrapia* (Astrapia nigra) *was observed feeding a juvenile of similar appearance. There are records of individuals living for 15 years or more in the wild. Although the range of potential predators includes snakes and* Accipiter *hawks, there are few documented records of natural predation. During intensive observation of nesting female Ribbon-tailed Astrapia and females of four other genera, instances of mobbing, distraction or other active anti-predator behaviour were rarely seen, although an anti-predator freezing posture has been recorded for Victoria's Riflebird and the Raggiana Bird-of-paradise* (Paradisaea raggiana).

[*Astrapia mayeri*, New Guinea. Photo: Clifford & Dawn Frith]



No bird-of-paradise species appears to be under immediate threat of extinction, but those with small ranges are vulnerable to significant environmental changes. The restricted-range ***Paradise Riflebird*** *is confined to remnant patches of wet forest in the Eastern Australia Endemic Bird Area. The Paradise Riflebird has lost much of its lowland habitat through forest clearance, and its range has consequently diminished. It is reportedly extinct in remnants as large as 60 ha of the Big Scrub Rainforest in north-east New South Wales, but is still described as common in upland forests in the north of its range.*

[*Ptiloris paradiseus*, Australia. Photo: Roland Seitre]

that two political entities, namely Indonesian West Papua and Papua New Guinea, house the majority of bird-of-paradise species, represent a far greater threat than the plume trade ever did. The modern threat results from habitat loss, poaching and illegal hunting, exotic predators, climate change and other adverse factors. This is, of course, particularly true of species with greatly restricted ranges or habitat specialists. Logging practices in New Guinea leave very much to be desired from the point of view of habitat quality and retention, and it is no secret that associated corruption and coercion are rife and widespread. As a result, there exist reports by local people of clearly observable declines in local bird-of-paradise populations. There are also documented past population declines of birds-of-paradise in Australia.

An inevitable effect of what has been the astonishingly rapid modernization of New Guinea is that technology and travel networks have outpaced the ability of landowners to protect and defend what is traditionally and rightfully theirs. As a consequence, people driving along highways can simply stop to shoot birds with little fear of reprisal. The fundamentally important traditionally vested interest in the sustainable harvesting of birds is broken down by people having no long-term interests in the sustainability of their activities.

The recent spread of feral cats and other exotic vertebrates into New Guinea habitats represents a real threat to some birds-of-paradise. At present no bird-of-paradise species appears directly threatened by exotic predators, but terrestrial-displaying ones certainly could be vulnerable, and additional introductions into New Guinea of, for example, macaques (*Macaca*) or other primates, reported already to be in West Papua, could cause catastrophic declines in the populations of native forest animals. Today, global climate change may represent one of, if not the, major threat to the future of birds-of-paradise, most immediately those species confined to zones of higher altitude.

The members of this family most at risk are probably those having a geographically limited range and restricted within a single political entity, with a general sparsity of populations and patchiness of distribution. It is possible, however, for a species with a geographically wide range to have a total population smaller than that of a species with a more restricted range. Within a patchy distribution the various local populations may be abundant to sparse. Both the Red and the Blue Birds-of-paradise are examples of single-nation endemic species, the former confined to Indonesia and the latter to Papua New Guinea. Both are vulnerable to political attitudes and policies, or the lack of policies. Nevertheless, no bird-of-paradise species is known to have become extinct in historical time.

Currently, three of the 42 members of the Paradisaeidae are considered to be globally threatened. These are Wahnes's Parotia, the Black Sicklebill and the Blue Bird-of-paradise. The first two have small global populations, estimated as being in the range 2500–10,000 individuals and, in both cases, declining. The Blue Bird-of-paradise has the same population estimate, but is suffering a continuing decline in the number of mature individuals, with consequent adverse effects on its population structure, over a severely fragmented range. All three of these species are classed

All five astrapias are restricted-range species. The ***Huon Astrapia*** *is confined to the Adelbert and Huon Ranges Endemic Bird Area, which occupies just 14,000 km² above the 1000 m contour line in north-east Papua New Guinea. Within this already very limited area, the Huon Astrapia is found in montane and subalpine forests above 1460 m. Although it is assumed not to be under any immediate threat, there are very few data on this species, and a survey of its current distribution, habitats and status is urgently needed.*

[*Astrapia rothschildi*, Huon Peninsula, New Guinea. Photo: Tim Laman]





*The **Long-tailed Paradigalla** is endemic to the Arfak Mountains of the Vogelkop peninsula, in north-west New Guinea. There are few records, but it is probably not uncommon, and it may occur on other mountain ranges in the Vogelkop. The extensive forests in its range are still generally undisturbed, but deforestation is occurring in the hills, and the species may be suffering local declines. It is currently considered Near-threatened. There are proposals to extend the 683 km² Pegunungan Arfak Nature Reserve, which is considered too small to protect viable populations of this and other members of the Arfak flora and fauna.*

[*Paradigalla carunculata*, Siyoubrig, New Guinea. Photo: Ashley Banwell]

as Vulnerable. In addition to these three globally threatened species, eight paradisaeids are currently considered to be Near-threatened. They are the Yellow-breasted Bird-of-paradise, the Long-tailed Paradigalla (*Paradigalla carunculata*), the Pale-billed Sicklebill, Wilson's Bird-of-paradise, the Ribbon-tailed Astrapia, and the Red, Emperor and Goldie's Birds-of-paradise. The Long-tailed Paradigalla is geographically one of the most restricted species.

Wahnes's Parotia is very poorly known, but it appears to be declining as a result of habitat loss. It is confined to forests in the mountains of the Huon Peninsula and the Adelbert Mountains, in north-east New Guinea, where it is found at 1100–1700 m. Although the human population in this region is relatively small, it is expanding rapidly, and more and more areas of forest are being cleared within the species' elevational range, which is the one preferred for settlement and agriculture by the local people.

The Black Sicklebill, possessing the longest plumes of all paradisaeids, is thought to be declining mainly because of hunting, but also because of forest clearance for agriculture. It has a wide range in the mountains of New Guinea, mainly at 1800–2150 m, but it is very patchily distributed, being seemingly absent over large areas. Where found, it is generally scarce to rare, and in places where it is reported as locally common, for instance on Mount Bosavi, it is often present in low densities. Much of this species' range, however, has not been surveyed in recent times, and the Black Sicklebill may be more common in the large areas of its range which are inaccessible and mostly uninhabited. The species is hunted for its magnificent tail feathers, and also for food. Skins of this species are becoming increasingly valuable, and the wider availability of shotguns and an increase in the human populations within the sicklebill's altitudinal range have led to a increase in hunting pressure. It is, of course, the adult males that are sought by hunters, and the result is an imbalance in the population structure; the species persists in areas where these males are lacking, but nothing is known of the breeding success in such areas. Even so, Black Sicklebill populations at Crater Mountain increased after the introduction of an enforced hunting ban.

Habitat loss and hunting for its pectoral plumes and tail feathers together represent the main threat to the Blue Bird-of-paradise. This eastern New Guinea species is confined to lower montane forest at 1400–1800 m, occasionally going a little higher or lower, and its narrow elevational range is precisely the same as that preferred by the human practitioners of slash-and-burn agriculture. Faced with ever-increasing human populations, this species is at great risk of local extinction in some of the intermontane valleys, although many inaccessible intermontane forests still support this species. Furthermore, although preferring primary forest, it may be able to survive in old secondary forest or fragmented primary forest, but it is often excluded from more degraded habitats as a result of the hunting of males and competition with the Raggiana Bird-of-paradise, which is more adaptable. The Blue Bird-of-paradise has a patchy distribution, in which it is nowhere common. Advertising males were recorded at intervals of about 200 m along one suitable forest ridge and 400 m along another, and at another study site males occupied home ranges each of up to 100 ha. It is interesting that, at this last-mentioned site, hunting pressure was greater and the forest habitat more patchy.

Of the eight Near-threatened members of the family, all appear to have a moderately small population and almost all have a small or very small range. All eight are, or appear to be, declining in numbers. They are potentially threatened primarily by loss or degradation of their habitats. The Yellow-breasted Bird-of-paradise appears to be absent from large areas of seemingly suitable habitat, and its rather small population is declining chiefly as a result of mining and logging activities. It is poorly known, as are several others in this category. The Emperor Bird-of-paradise, for example, is not uncommon within its small range in the Huon Peninsula, but it is poorly known; nevertheless, it is probably declining fairly rapidly, as it tends to be replaced in degraded forest by Raggiana's Bird-of-paradise. Goldie's Bird-of-Paradise, equally poorly known, is probably in decline as a consequence of forest degradation in its restricted range in the D'Entrecasteaux Archipelago, off south-east New Guinea. If the larger islands within its range were to be targeted for large-scale logging activity and development, it might be necessary for this beautiful bird-of-paradise to be moved to one of the globally threatened categories.

Apart from the species discussed above, there are others that deserve to be monitored over the coming decades. These include the Standardwing Bird-of-paradise in the Moluccas, the Arfak and Huon Astrapias and the Western and Foja Parotias (*Parotia berlepschi*) of isolated mountain ranges in New Guinea,



***Wahnes's Parotia** is confined to narrow belts of mid-montane forest in New Guinea's Huon Peninsula and Adelbert Mountains. The human population of this region is growing rapidly, and the habitat of Wahnes's Parotia unfortunately coincides with the optimum altitudes for settlement and agriculture. It has been seen foraging near active gardens and appears tolerant of many human activities, but may require undisturbed habitat for breeding. Its estimated total population is of 2500–10,000 birds, and it is categorized as Vulnerable. As well as investigating population trends at known sites through interviews with local villagers, BirdLife International proposes surveys of other mountain ranges in the Huon Peninsula which have not been visited recently.*

[*Parotia wahnesi*, Huon Peninsula, New Guinea. Photo: Tim Laman]



*Traditional sustainable hunting regimes are breaking down as New Guinea undergoes modernization, with wider availability of shotguns and a growing network of roads. The Vulnerable **Black Sicklebill** is hunted both for the tail feathers of the males, and for food. The species persists in areas where adult males have been hunted out, but nothing is known of the breeding success of these populations. When a hunting ban was enforced at Crater Mountain, numbers increased. A similar ban is now enforced around the Ok Tedi copper mine, where heavy hunting had caused a dramatic decline.*

[*Epimachus fastosus*, Arfak Mountains, New Guinea. Photo: Richard Kirby/ naturepl.com]

and the two Australian endemic riflebird species that inhabit remnant patches of wet forest. Concern was once expressed over the populations of the subspecies *trobriandi* of the Curl-crested Manucode in the face of habitat loss associated with human population growth, and some low coral islands involved may also be vulnerable to sea-level rise resulting from global warming. This taxon is restricted to the Trobriand Group, off south-east New Guinea.

An analysis of comprehensive paradisaeid distributions over New Guinea in the light of terrane tectonics indicates that conservation efforts concerning this family should take into account their apparent primary centre of diversity, which is located in the Mount Hagen–Jimi Valley–Wahgi Valley region.

No bird-of-paradise species would appear to be currently under imminent threat, but those restricted in distribution or having sparse populations are vulnerable to significant environmental changes. It is therefore important that we learn much more about the biology and ecology of these species before circumstances become much worse. Captive-breeding programmes should certainly be considered now, while wild populations remain healthy, rather than waiting until they are not, particularly as dietary problems previously limiting captive-breeding success and DNA sexing have recently been overcome and the necessary changes implemented. As a result, several more easily obtainable species are now frequently bred in Europe, the USA and elsewhere. It should be noted and acknowledged that aviculture has proven to be a significant method in learning of aspects of the biology and behaviour of these birds that are difficult to determine in the wild.

*The Vulnerable **Blue Bird-of-paradise** is a single-nation endemic species, confined to Papua New Guinea. Such species are at particular risk from changes in political attitudes and policies. The Blue Bird-of-paradise is patchily distributed in the eastern central mountain ranges of New Guinea, mostly at 1400–1800 m, with adult males further confined to the middle levels of this elevational range. This corresponds all too well to the optimum range for settlement and agriculture, and the species seems doomed to disappear from the more populous intermontane valleys; it is also hunted for its plumes. Nevertheless, significant areas of its range are inaccessible and largely uninhabited, giving grounds for some optimism for its survival.*

[*Paradisaea rudolphi margaritae*, Tari Gap, New Guinea. Photo: Alain Compost]



General Bibliography

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Subfamily CNEMOPHILINAE

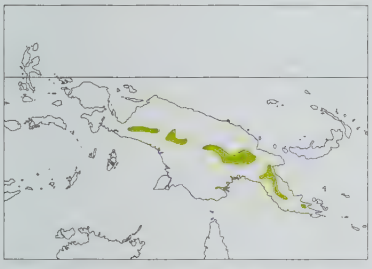
Genus *CNEMOPHILUS* De Vis, 1890

1. **Loria's Bird-of-paradise**

Cnemophilus loriae

French: Cnémophile de Loria **German**: Loriaparadiesvogel **Spanish**: Ave-del-paraíso de Loria
Other common names: Loria's Cnemophilus/Bird

Taxonomy. *Loria loriae* Salvadori, 1894, Moroka, Owen Stanley Range, New Guinea.
This genus and *Loboparadisea* sometimes united in a separate family, Cnemophilidae. Species sometimes placed in a monotypic genus, *Loria*. Sympatric with *C. macgregorii* at c. 2600 m on Mt Hagen and 2200–2650 m in Ambua Range, but hybridization unrecorded. Three subspecies recognized.
Subspecies and Distribution.
C. l. inexpectatus (Junge, 1939) – W & C ranges (including Weyland, Nassau, Oranje, Hindenberg and Victor Emanuel Mts) of New Guinea.
C. l. amethystinus (Stresemann, 1934) – Schraderberg, Wahgi Divide, Bismarck Range, Kubor Range, Mt Hagen and Giluwe Range (also, presumably, Mt Bosavi) in E New Guinea.
C. l. loriae (Salvadori, 1894) – Herzog and Kuper ranges (E of Watut/Tauri Gap) SE through Owen Stanley Range to Mt Dayman, in SE New Guinea.



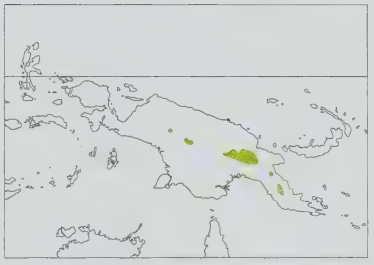
Descriptive notes. 22 cm; male 75–101 g, female 60–96 g. Dark, with basal upper ridge of culmen sharply keeled, gape wide, and tail graduated. Male nominate race has velvety black plumage with purple and/or magenta sheens; fine scale-like lores; head iridescent metallic green-blue, washed purplish; tertials iridescent green-blue to blue, washed purple to magenta; iris dark brown; bill shiny black, conspicuous bare gape-flanges and mouth interior yellowish-white, sometimes with pale pink or green hue; legs dark olive-brown to blackish. Female differs radically from male in having olive-green plumage, notably browner on wings and tail, more yellowish on belly, and no gape-flanges; also on average fractionally smaller. Juvenile is grey, this plumage worn only briefly; immature male similar in plumage to adult female, has more pointed, longer rectrices than adult male, acquires shorter tail progressively with age; subadult male varies from being like adult female but with few feathers of adult male plumage intruding, to being like adult male with few feathers of female-like plumage remaining. Race *amethystinus* differs from nominate in that male has violet-purple iridescent upper tertials, female slightly longer tail; *inexpectatus* male has much more green iridescence on tertials, female has slightly shorter tail. Voice. Advertisement call of male a monotonous, regularly repeated, ringing "weeep" or "pseep", ventriloquial and far-carrying but not powerful. Alarm once reported, and nesting female gave soft, low rasping scold note, repeated 4–5 times.
Habitat. Middle montane to upper montane forests, forest edge and second growth; 1500–3000 m, mostly 2000–2400 m.
Food and Feeding. Fruits, mostly simple drupes/berries plucked and swallowed whole, without manipulation by bill or feet; earthworms (Oligochaeta) also eaten. Fruits harvested in middle and lower storeys of forest and forest edge. Usually forages alone, but groups of 3–4 (rarely, up to ten) female-plumaged birds, sometimes with an adult male or other bird-of-paradise species, recorded in fruiting tree.
Breeding. Breeding Nov–Feb; an egg laid early Jan near Tari (E New Guinea); display season undefined, but singing noted Mar, Jul and Sept–Jan (various localities), and a display seen in Oct. Polygynous; presumed solitary, promiscuous male attends traditional advertisement-singing perches; females build and attend nest alone. Solitary courtship on bare or foliaged exposed canopy perch; mostly static simple display postures that exhibit iridescent lore feathering and pale gape-flanges and/or mouth interior; an inverted display with regular clicking noise (probably made with bill) and with quivering half-opened wings. Nest a substantial globular domed structure with horizontally ovate entrance hole, externally of fresh moss and filmy fern fronds, inner chamber lined with supple fresh epiphytic orchid stems, c. 20–30 straight sticks placed into and on nest-entrance perch and within moss beneath; built at average of 1·5 m above ground, blends cryptically with plants on adjacent surfaces; habitual use of some nest-sites. Clutch probably 1 egg; incubation at one nest c. 25 days; no information on nestling period.
Movements. Presumably resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. CITES II. Common and widespread throughout range; secretive habits, however, may suggest otherwise. Possibly rare in Ilaga forests, in WC New Guinea, as a result of hunting. No apparent short-term threat to any of the races.
Bibliography. Beehler & Pruett-Jones (1983), Diamond (1972), Frith (1987a, 1996), Frith & Beehler (1998), Frith & Frith (1993a, 1994c, 1997b), Gilliard (1969), Gilliard & LeCroy (1961), Gregory (1995), Gyldenstolpe (1955a), Hicks, J.H. & Hicks (1988), Hopkins (1992), Mayr & Gilliard (1954), Mayr & Rand (1937), Melville (1979), Rand (1942b), Ripley (1964), Schodde (1976), Stein (1936), Stresemann (1934b).

2. **Crested Bird-of-paradise**

Cnemophilus macgregorii

French: Cnémophile huppé **German**: Furchenparadiesvogel **Spanish**: Ave-del-paraíso Crestada
Other common names: Crested Cnemophilus, Sickle-crested/Multi-crested/Macgregor's Bird-of-paradise

Taxonomy. *Cnemophilus macgregorii* De Vis, 1890, Mount Knutsford, Owen Stanley Range, New Guinea.
This genus and *Loboparadisea* sometimes united in a separate family, Cnemophilidae. Sympatric with *C. loriae* at c. 2600 m on Mt Hagen and 2200–2650 m in Ambua Range, but hybridization unrecorded. Birds from Kubor Mts (E New Guinea) described as additional race, *kuboriensis*, synonymized with *sanguineus*. Geographical extent of nominate race uncertain, possibly wider than is listed below. Two subspecies recognized.
Subspecies and Distribution.
C. m. sanguineus Iredale, 1948 – mountains of E New Guinea (Mt Giluwe and Mt Hagen region E to at least Bismarck Mts and Kubor Range).
C. m. macgregorii De Vis, 1890 – SE New Guinea (E at least from Ekuti Divide, E of Watut/Tauri gap).
Also recorded N of L Habbema (sighted) and in West Papua (collected), but neither record diagnosable to subspecies.



Descriptive notes. 24 cm; male 90–120 g, female 79–125 g. Upper ridge of culmen broadly flat towards skull, gape wide, tail graduated. Male nominate race has forehead, upper ear-coverts and entire upperparts brilliant silky flame-yellow with iridescent white highlights, duller on back, and cinnamon on upperwing and uppertail; small erectile (usually concealed) sagittal crest of 4–6 sickle-shaped feathers dark buff with golden iridescent gloss; lores, lower ear-coverts, tiny narrow line above centre of eye, and entire underparts brownish-black with coppery-bronze dull sheen; variable cinnamon feathers on thighs and flanks; iris dark brown to bluish-grey; bill dark brownish-black, mouth pinkish; legs purplish-brown to brown-black. Female is very different from male, fairly uniform brown-olive, underparts slightly paler and buffier, especially on belly and undertail-coverts, with iris dark brown-grey to dark bluish-grey, bill brownish-black, legs dark brownish to brownish-black, mouth pale green, also slightly smaller. Juvenile is briefly grey; immature male like adult female but with paler bill, legs and iris brownish to brown-grey; subadult male varies, from like adult female with few feathers of adult male plumage to like adult male with few feathers of female-like plumage remaining, also tail longer than adult male. Race *sanguineus* differs from nominate in having slightly longer wing and shorter tail, adult male with considerably richer and reddish dorsal plumage, and underparts with less copper-red sheen. Voice. Unconfirmed if male has advertisement vocalization. Calls include harsh and rasping sounds, low harsh hissing, loud clicking repeated several times, and explosive muffled bark repeated at long intervals. A female attending nestling gave soft "wark, wark" on approaching nest; another nest-approaching female repeated a soft sharp "whit", and when disturbed produced soft churring growl as scold; harsh persistent sound like scraping or the tearing of heavy material sometimes uttered by female when disturbed at nest with young.
Habitat. Upper montane and subalpine forest and forest edge, including secondary growth, disturbed vegetation and shrubbery; 2100–3650 m, mainly 2600–3500 m.
Food and Feeding. Only fruits recorded, mostly simple drupes or berries plucked and swallowed whole, without manipulation by bill or feet. Nestling fed exclusively with fruits (odd tiny shelled mollusc incidental). Fruits taken mainly from middle and lower strata of dense forest edges or second growth. Usually forages alone, but several males (up to nine) and female-plumaged individuals may gather in fruiting plants together with other frugivorous species, including other members of present family.
Breeding. Season Aug–Jan in EC highlands; display season undefined, but birds with enlarged gonads in Jun–Nov on Mt Hagen, courting well established in Jun, full sperm production Jul–Sept, and mating before mid-Nov. Polygynous; presumed solitary, promiscuous male attends traditional advertisement-singing perches; female builds and attends nest alone. Male appeared to patrol possible territory c. 200 m in diameter, but territoriality unconfirmed. Nest globular with horizontally ovate entrance hole, externally consisting of green mosses and green fern fronds (which blend with adjacent vegetation) placed on foundation of woody sticks, interior lined exclusively with green-yellow epiphytic orchid stems, and egg-chamber with finer ones; built c. 2–4 m above ground atop decayed mossy tree stump, on side of mossy tree trunk, or within branches of tree and associated vegetation. Clutch probably 1 egg; incubation period more than 19 days; nestling period more than 30 days.
Movements. Few data. Limited information suggests that numbers of individuals above 2600 m on Mt Giluwe increased during dry season, when moving to upper altitudinal limit.
Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. CITES II. Secretive habits limit meaningful assessment of abundance, but no immediate or long-term global threats apparent. Occurs patchily, in part a result of restricted altitudinal range.
Bibliography. Beehler *et al.* (1986), Clapp (1986), Coates (1990), Diamond (1972), Frith (1996, 1998), Frith & Beehler (1998), Frith & Frith (1993c, 1997b), Frith & Harrison (1989), Gilliard (1969), Gyldenstolpe (1955a), Hoyle (1975), Kwapena (1985), Loke Wan Tho (1957), Mack & Wright (2000), Marshall (1954), Mayr & Rand (1937), Peckover (1990), Sims (1956).

Genus *LOBOPARADISEA* Rothschild, 1896

3. **Yellow-breasted Bird-of-paradise**

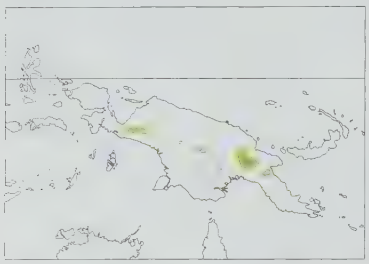
Loboparadisea sericea

French: Cnémophile soyeux **German**: Lappenparadiesvogel **Spanish**: Ave-del-paraíso Sedosa
Other common names: Yellow-breasted Cnemophilus/Bird-of-paradise, Wattled/Wattle-billed/Shield-billed Bird-of-paradise

Taxonomy. *Loboparadisea sericea* Rothschild, 1896, western New Guinea.
This genus and *Cnemophilus* sometimes united in a separate family, Cnemophilidae. Two poorly defined subspecies recognized.

On following pages: 4. Paradise Crow (*Lycocorax pyrrhopterus*); 5. Glossy-mantled Manucode (*Manucodia ater*); 6. Jobi Manucode (*Manucodia jobiensis*); 7. Crinkle-collared Manucode (*Manucodia chalybatus*); 8. Curl-crested Manucode (*Manucodia comrii*); 9. Trumpet Manucode (*Manucodia keraudrenii*); 10. Long-tailed Paradigalla (*Paradigalla carunculata*); 11. Short-tailed Paradigalla (*Paradigalla brevicauda*).

Subspecies and Distribution.
L. s. sericea Rothschild, 1896 – mountains of New Guinea from Weyland Mts E, discontinuously, to at least Victor Emanuel Mts, Kubor Range, Mt Karimui and Soliabeda.
L. s. aurora Mayr, 1930 – Herzog Range (E of Watut/Tauri gap) and upper Jimi R, in SE New Guinea.



Descriptive notes. 17 cm; male 50–75 g, female 60–77 g. Basal upper ridge of culmen broadly flattened, gape wide, tail slightly graduated. Male nominate race has bulbous narial wattles (bilaterally bifurcate) and bare skin over mandible bases pale, chalky turquoise-green or yellow; lores and side of face dark brown, crown similar but with coppery-green sheen; nape, mantle and upper back honey-brown with darker feather tips, washed iridescent coppery yellow, lower back and rump pale silky iridescent sulphur-yellow; tail and upperwing and its coverts honey-brown, darker tips on primaries, secondaries and rectrices; malar area and entire underparts silky or glassy sulphur-yellow; thigh feathers dark brown; iris dark brown; bill blackish, mouth dull-coloured (lacking bright pigment); legs blackish. Female is slightly larger than male (uniquely within family), lacks wattles, and has different plumage, dark olive-brown above with cinnamon-brown on exposed wings, and paler, more yellowish-buff, underparts with darker streaking, especially on breast. Juvenile undescribed, possibly briefly grey; first-year immature dark olive-brown above, washed amber on wing and tail, lacking yellow, underparts cinnamon, dark feather edgings on breast forming broad greyish streaking, belly pale greyish; second-year plumage of both sexes like adult female, but darker below and less yellow above; tail of immature male longer than adult's, progressively shorter with age, wattles require at least a year to develop fully, changing from black, to black mottled with turquoise-green, to adult male colour. Race *aurora* male is fractionally larger than nominate, more so in tail length, and upperparts significantly brighter (paler), more brown-yellow, crown far paler and more greenish, less brown, narial wattle pale blue. Voice. Unconfirmed if male has advertisement vocalization. Calls include series of loud, harsh, grating notes slightly upslurred, "sssh sssh sssh", usually 2 notes followed by brief pause and again 2–3 notes, notes becoming slower and stronger as series continues; lower-pitched than notes of *Lophorina superba*.
Habitat. Interior of middle montane forest; 600–2000 m, mainly above 1200 m.
Food and Feeding. Little known. Possibly almost exclusively fruits, simple drupes and berries plucked and swallowed whole; one individual had arthropods in stomach. Forages in canopy, lower canopy and upper middle storey, but also frequents lower strata of forest. Singly or in groups of up to ten individuals in fruiting trees or undergrowth.
Breeding. Males with moderately enlarged gonads in Jun and Aug and greatly enlarged ones May and Oct. Presumed polygynous, with solitary promiscuous males; females build and attend nest alone. Nest said to be an open moss structure built in branches in vegetation; clutch reported as 1 egg by local informant. No other information.
Movements. No information.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Central Papuan Mountains EBA. CITES II. Poorly known. Locally common, but patchily distributed; absent from seemingly suitable forests, perhaps owing to lack of significant food plants. Possibly overlooked because of its secretive behaviour and rugged, rarely visited habitat. Population appears to be fairly small, and declining owing to mining and logging activities. Habitat in most of its range, however, is reasonably secure, and probably safe from large-scale habitat degradation.
Bibliography. Anon. (2008j), Beehler (1991), Bishop (1987), Butchart & Stattersfield (2004), Collar *et al.* (2001), Cracraft (1992), Diamond (1972), Frith & Beehler (1998), Frith & Frith (1994c, 1997b), Gilliard (1969), Gilliard & LeCroy (1961), Gyldenstolpe (1955a), Mack & Wright (2000), Rand & Gilliard (1967), Schodde (1976), Stattersfield & Capper (2000), Stein (1936).

Subfamily PARADISAEINAE

Genus *LYCOCORAX* Bonaparte, 1853

4. Paradise Crow

Lycocorax pyrrhopterus

French: Paradisier corvin **German**: Krähenparadiesvogel **Spanish**: Ave-del-paraíso Corvina
Other common names: Brown-winged Bird-of-paradise, Brown-winged/Obi/Morty Island Paradise-crow, Silky Crow

Taxonomy. *C[orvus] pyrrhopterus* Bonaparte, 1850, Gilolo [= Halmahera].
Originally described as a crow (Corvidae). Distinctive race *obiensis* possibly a separate species; study required. Three subspecies recognized.
Subspecies and Distribution.
L. p. morotensis Schlegel, 1863 – Morotai and Rau, in N Moluccas.
L. p. pyrrhopterus (Bonaparte, 1850) – Halmahera, Kasiruta and Bacan.
L. p. obiensis Bernstein, 1864 – Bisa and Obi (S of Halmahera).
Descriptive notes. 42 cm; male 242–370 g, female 218–316 g. Nominate race has entire head slightly glossy blackish dusky-brown, darkest on crown; mantle to uppertail-coverts paler and greyer with dull blue-grey gloss or sheen (with slight green cast); upperwing brown, darker on coverts and tertials than the dark cinnamon-brown flight-feathers, variably white concealed bases of primaries (obvious in flight); tail glossy blackish-brown, rectrices with fine hair-like central points; underparts as mantle but paler, and with blue-green gloss, browner on belly, vent and undertail-coverts; iris blood-red, small area of bare grey skin behind eye; bill shiny black; legs black. Sexes alike in plumage, female on average smaller than male. Juvenile has crown, middle of back and dorsal surface of tail as adult, rest of plumage brownish with only slightest of blue-black gloss, downy underparts matt brownish; immature duller-coloured, less blackish below than adult, possibly with paler brown wings. Race *obiensis* is like nominate but darker, more glossy blue-green, more blue-black on crown and tail, and with only trace of white on concealed bases of primaries; *morotensis* is



largest race, much like nominate but paler, more brownish, above, slightly darker below, with concealed bases of primaries extensively white. Voice. Several distinct vocalizations, some advertisement and others contact or alarm notes. Geographical variation, e.g. on Obi (race *obiensis*) a "wuhk" or "wunk" note or loud "who-up" often answered by loud "hwhoo"; on Halmahera (nominate) a short hoarse dog-like bark, "woo-up", second note rising and often followed by harsh rasping "krek" or "rek" (which may also be given alone), and loud "wu-wnk", "kreck rek" or "krek kek". On various islands a soft "rrr" call like that of a coucal (*Centropus*), harsh rasping "tschak...tschak", low deep "om", repeated single, moderately loud, dry, slightly upslurred guttural barking or croaking "ekk", short frog-like "ech", and repeated loud, deep, resonant, disyllabic "óó-lip" or deeper "óó-lee" of which first syllable deep and descending and second high-pitched and rising.
Habitat. Lowland, hill, and middle montane forests, fairly open agricultural land with scattered scrub and trees, coconut (*Cocos nucifera*) plantations, and orchards; rarely in swamp-forest and in mangroves adjacent to swamp-forest. Sea-level to hills, to at least 800 m on Obi, at least 1500 m on Halmahera and 1700 m on Bacan.
Food and Feeding. Mostly fruits, some arthropods. At least fruits fed to nestlings. Forages mainly in dense upper middle storey and canopy foliage. Usually forages singly or in twos, occasionally in groups of up to five individuals; rarely in mixed-species flocks or with pigeons (Columbidae).
Breeding. Season at least Dec to early Jun, single nestlings in two nests (Mt Gamkonora, on Halmahera) mid-Apr; males with enlarged gonads Jan, Jun, Aug and Oct–Nov and female in Jul. Monogamous. Nest an open bowl-shaped structure, like that of *Manucodia* but bulkier, exterior of lightweight woody curled vine stems, tendrils, dead leaves and/or moss, lined with pale wood chips or flaky bark, egg-chamber lining of coarse springy hair-like tendrils, built into fork of subcanopy branches 4–15 m above ground. Clutch 1 egg. No other information.
Movements. No information.
Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Maluku EBA. CITES II. Locally common on Halmahera; moderately common to common on Obi and Bisa. On Halmahera, average of 0·2 (0·1–0·4) birds/ha in habitats on limestone and other sedimentary rocks, and 0·5 (0·3–0·8) birds/ha in montane habitats; in Sept 1994 and in 1995–1996, average density of 0·4 (0·1–0·9) birds/ha in logged lowland forest on sedimentary rocks.
Bibliography. Bernstein (1864), Coates & Bishop (1997), Frith (1998), Frith & Beehler (1998), Frith & Frith (1997b), Frith & Poulsen (1999), Heinrich (1956), Lambert (1994), Lambert & Young (1989), Linsley (1995), Parker (1963), Poulsen & Lambert (2000), Ripley (1959), White & Bruce (1986).

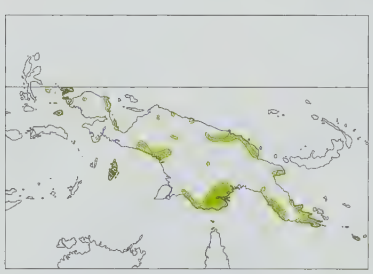
Genus *MANUCODIA* Boddaert, 1783

5. Glossy-mantled Manucode

Manucodia ater

French: Paradisier noir **German**: Glanzparadieskrähe **Spanish**: Ave-del-paraíso Negra
Other common names: Glossy/Black Manucode

Taxonomy. *Phonygama ater* Lesson, 1830, Dorey, north-west New Guinea.
Sympatric with *M. jobiensis*, *M. chalybatus* or *M. keraudrenii* at various localities, but no cases of hybridization recorded. Geographical variation largely clinal; species sometimes treated as monotypic. Listed distribution of race *subalter* uncertain, and biogeographically odd; study of geographical variation required. Three subspecies currently recognized.
Subspecies and Distribution.
M. a. ater (Lesson, 1830) – mainland New Guinea from Vogelkop E patchily to Huon Gulf and, in S, to Purari R.
M. a. subalter Rothschild & E. J. O. Hartert, 1929 – West Papuan Is (Gebe, Waigeo, Gam, Batanta, Salawati, Misool), Aru Is, and SE peninsula of New Guinea (E from Kumusi R in N watershed and, in S, from NE Gulf of Papua).
M. a. alter Rothschild & E. J. O. Hartert 1903 – Tagula I, in Louisiade Archipelago (off SE New Guinea).



Descriptive notes. Male 38–42 cm, 170–315 g; female 33–37 cm, 155–252 g. Large paradisaeid with long, graduated tail; base of culmen ridge broadened and flattened to a degree intermediate between those of *M. jobiensis* and *M. chalybatus*. Male nominate race has head and neck blue-black with iridescent blue-green tipping on smooth feathering, also plum-purple sheen in some lights; dense feathers above each eye (not elongated or erectile); smooth-plumaged blue-black mantle, back, rump, upperwing and uppertail with iridescent glosses of blue and of purple to magenta, tail may show subtle blackish barring, rectrices have tiny hair-like central points; iridescent tipping on each feather of chin and throat forms inverted V-shape; breast as upperparts, but more blue-green iridescence increasing on belly, vent and undertail-coverts; iris blood-red with brown inner ring; bill dark grey to black, legs black. Female is on average smaller than male, also with glosses greener, less purple, particularly on underparts. Juvenile is downy and dull brownish-black, this subsequently broken up by glossy feathers of immature plumage (initially more so on upperparts); immature duller than adult, tail on average slightly shorter, iris orange-yellow to yellowish-orange (and probably changing with age), difficult to differentiate from immature *M. chalybatus*. Race *subalter* is larger than nominate, male differs also in having more purple and violet colours (oil-green colour rare); *alter* is considerably larger than other two races, bill length of adult male exclusively so, and male flanks and belly more violet than nominate. Voice. Male gives mournful, high-pitched drawn-out advertisement call (tone having quality of electical feedback); also subdued "korrrrr-korrrrr" or soft "kwek", and hoarse "kek-

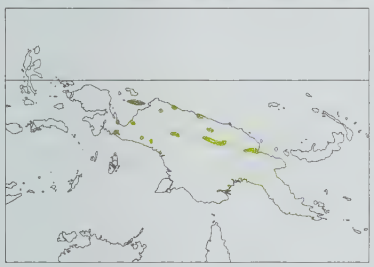
kek-kek" and soft screeching. A deep "chug", "chook" or "ack, ack, ack" given by individuals alarmed near nest; "tuck tuck" during feeding or flying.
Habitat. Lowland rainforest, swamp-forest, forest edge, riverine and monsoon forests, woodlands, denser savanna woodlands, savanna, mangroves, gardens, and associated secondary growth; usually in primary forest and mature secondary forest, only occasionally edges of gardens with remnant trees. Sea-level to low hills, less commonly to 1100 m.
Food and Feeding. Mostly fruits, especially figs (*Ficus*), possibly also flowers (perhaps nectar); also some animals, including insects and worms (Oligochaeta). Nestlings diet regurgitated fruits. Forages mostly in canopy and in subcanopy, also in low dense vegetation. Usually encountered singly or in pairs, occasionally in small feeding associations with conspecifics and/or other frugivorous birds; commonly joins mixed-species flocks of black-plumaged and/or brown-plumaged species; chases foraging competitors from fruiting trees.
Breeding. Season at least Aug–Mar; males with fairly enlarged gonads in Feb–May and much-enlarged ones Jun–Jan, egg-laying Jan, Mar and Aug–Oct, and nestling c. 1 day old in late Sept; one display recorded in Jan. Monogamous pair-bonding; apparently non-territorial. Display on tree branches involving a chase, and then static, male slightly spreading and shaking wings and tail and erecting body plumage. Nest a deep firm cup of slender semi-woody to woody dead and dry vine tendrils or stems, sometimes with few green ones, coiled and interwoven into neat cohesive whole, inner layer of dead leaves and a quantity of dead, dry, rotten wood, with cup lining of blackish semi-woody supple stems bent around inside cup; suspended in forked branch 4–12 m above ground in small tree in tall open rainforest, at or near rainforest/open woodland or savanna edge, in savanna, beside rainforest clearing or in mangrove. Clutch 1–3 eggs; incubation c. 15–17 days; chicks brooded and fed by both parents, both also swallow chicks' faeces, duration of nestling period uncertain, more than 19 days.
Movements. Presumably resident.
Status and Conservation. Not globally threatened. CITES II. Common but inconspicuous; possibly sparsely distributed throughout fragmented range. Common and widespread in Aru Is. Appears not to be at any immediate risk. Survey required of isolated island race *alter* in view of known logging and forest-clearance activity going on in Louisiade Archipelago.
Bibliography. Beehler *et al.* (1986), Bell, H.L. (1982c, 1984a), Bergman (1961), Coates (1990), David & Gosselin (2002b), Diamond (1987b), Frith (1994b), Frith & Beehler (1998), Frith & Frith (1997b), Gilliard (1950, 1956b, 1969), Gilliard & LeCroy (1966), Mayr & Rand (1937), van Oort (1909), Ramsay (1883b), Rand (1938c), Rand & Gilliard (1967), Rothschild & Hartert (1929), Wahlberg (1992).

6. Jobi Manucode

Manucodia jobiensis

French: Paradisier de Jobi **German**: Jobiparadieskrähe **Spanish**: Ave-del-paraíso de la Jobi
Other common names: Allied Manucode

Taxonomy. *Manucodia jobiensis* Salvadori, 1876, Wonapi, Yapen Island (Jobi), New Guinea.
Sympatric with *M. ater*, *M. chalybatus* or *M. keraudrenii* at various localities, but no cases of hybridization recorded. Birds from Rubi (Geelvink Bay) described as race *rubiensis*, but considered inseparable from those in rest of range. Monotypic.
Distribution. Yapen I and W & N mainland New Guinea from Rubi (W Geelvink Bay) E discontinuously in lowlands to mouth of Ramu R and, in S, from area of Mimika R to Setekwa R.



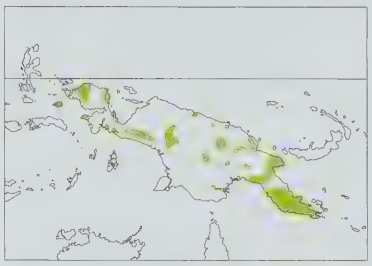
Descriptive notes. Male 34 cm, 212–257 g; female 31 cm, 150–205 g. Large paradisaeid with slightly graduated tail; base of culmen slightly broadened and flattened (far less so than in congeners except *M. keraudrenii*). Has blue-black head and neck with iridescent blue-green tipping on smooth feathering, plum-purple gloss in some lights; nape, neck, chin and throat distinctly barred (iridescent tips contrast with dark matt feather portions); mantle, back, rump and uppertail-coverts blue with iridescent violet-purple gloss and magenta sheen, all barred with broad matt black feather tipping; uppertail deep blue-black, uniformly glossed rich violet-purple with magenta sheens, rectrices with tiny hair-like central points; upper breast as mantle but less purple, lower breast, belly and thighs with iridescence progressively even less purple, more green-blue, vent and undertail-coverts matt brownish-black with subtle green-blue gloss; iris blood-red; bill dark grey to black, legs black. Sexes similar, adult female on average smaller and duller than male. Juvenile has downy upperside and underside, crown and throat brownish-black, crown more matt blackish to dull sooty black, upperwing and tail progressively coloured and glossy with age; immature like adult but duller. Voice. Little known. A series of 4–6 slowly delivered hollow "hoo" notes, much as for *M. chalybatus*, said to be advertisement song; also harsh "chig" or "becheg" call notes.
Habitat. Lowland rainforest, swamp-forest, hill forest, and forest edge; sea-level to 500 m, rarely to 750 m.
Food and Feeding. Fruits and arthropods, but relative preference unknown. Forages for arthropods at up to 15 m in middle storey. Joins mixed-species foraging flocks of predominantly black and/or brown birds, including other birds-of-paradise, with or without Rusty Pitohuis (*Pitohui ferrugineus*) and New Guinea Babblers (*Pomatostomus isidorei*).
Breeding. Birds with gonads fairly enlarged in Jun–Aug and Dec–Jan and much enlarged in Feb–Mar, May and Jul across range; single egg late Dec at Mimika R. Solitary display in tree branches. Nest a deep cup of roots, creepers and leaves, one suspended 2·4 m above ground between two horizontal branches. One clutch contained 2 eggs. No other information.
Movements. No information.
Status and Conservation. Not globally threatened. CITES II. Locally common. As this is a little-known species easily confused with *M. chalybatus*, some of the reported records may be open to question.
Bibliography. Beehler *et al.* (1986), van Bemmel (1947b), Frith & Beehler (1998), Frith & Frith (1997b), Gilliard (1969), Madarász (1897), Ogilvie-Grant (1915), Rothschild (1931, 1932).

7. Crinkle-collared Manucode

Manucodia chalybatus

French: Paradisier vert **German**: Grünparadieskrähe **Spanish**: Ave-del-paraíso Metálica
Other common names: Green-breasted/Green/Crinkle-breasted Manucode

Taxonomy. *Paradisea Chalybata* J. R. Forster, 1781, Arfak Mountains, New Guinea.
May form a superspecies with *M. comrii*. Sympatric with *M. ater*, *M. jobiensis* or *M. keraudrenii* at various localities, but no cases of hybridization recorded. Monotypic.
Distribution. West Papuan Is (Misool) and scattered sites throughout mainland New Guinea.



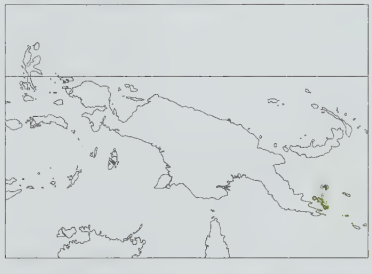
Descriptive notes. Male 36 cm, 164–265 g; female 33 cm, 160–255 g. Large paradisaeid with fairly long, graduated tail. Male has blue-black head, neck and nape, blue-green iridescent feather tips forming inverted V-shapes on chin, throat, neck and nape; blue-black mantle, back, rump, uppertail-coverts and uppertail with iridescence predominantly of violet-purple with magenta and/or blue sheens; indistinct dark barring sometimes apparent on uniformly glossy purple uppertail in some lights; rectrices with tiny hair-like central points; conspicuous darker broad barring on mantle formed by matt black feather tipping; lower throat, neck and upper breast feathering has fringed edging, creating crinkled surface with conspicuously bronzed yellow-green iridescence; blue-black lower breast and remaining underparts with violet-purple gloss and, in some lights, magenta sheen, darker (blackish) feather tipping giving barred appearance that is less conspicuous on matt blackish vent and undertail-coverts; iris deep red, with dark brown inner ring; bill dark grey to black, legs black. Female is on average smaller than male, also duller below, underparts more green-blue, less purple. Juvenile and immature are like adult female, but breast and belly even greener (lacking purple), chin and throat matt blackish, iris greyish-brown to dark brown, difficult to differentiate from young of *M. ater*; subadult similar to adult, but less purple and less barred, iridescent blue-green of throat and breast duller, and belly more blackish. Voice. Advertisement song of male a slow series of up to 8 low, even-pitched, hollow "hoo" notes; presumed female response a softly whistled series of descending notes, "u -o-u-o-u-o-u–o". Call notes transcribed as "tuk", "chenk", "chook" or "thtop"; short, sharp, high-pitched "kok", sharp "tchich", "kick" or "chack", also high-pitched, nasal, mammal-like trill, short whining cries and low pig-like grunting. Displaying male gives deep "ummmh" or hollow "whoo hoouw", "hmmm" or "hmmm–hoo", or may give deep hollow "hoouw" singly or repeated at intervals of many seconds and fading as display subsides. Female gives single "chengk!" note.
Habitat. Hill and lower montane forest throughout New Guinea mainland, also lowland forest on Misool; sea-level to 1700 m, mostly 500–600 m.
Food and Feeding. Mainly fruits, especially figs (*Ficus*); also invertebrates, including insects and spiders (Araneae). Forages mostly in middle to canopy levels, but also lower when seeking invertebrates. Aggressively defends fruiting trees from other frugivorous birds. Commonly joins mixed-species feeding flocks of predominantly black and/or brown birds.
Breeding. Breeding at least Jul–Sept and Jan; display recorded in Apr, Jun, Jul and Sept. Monogamous pair-bonding; non-territorial. Display on tree branches, male chasing female through foliage via numerous perches; with each display call note, male expands breast and mantle feathering as he leans forwards to stretch neck and raise head. Nest of wiry stalks, intermingled with leaves, lined with finer stalks and fibres, suspended between forking branches of tree limb. Clutch 1–2 eggs; both sexes probably provision young, but this unconfirmed. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. CITES II. Fairly common over much of range; secretive habits make census difficult. Wide-ranging; an individual radio-tracked for a week during Nov on Mt Missim (E New Guinea) covered a range of c. 45 ha.
Bibliography. Anon. (1972), Beehler (1983b), Coates (1990), Cracraft (1992), David & Gosselin (2002b), Diamond (1972, 1987b), Frith & Beehler (1998), Frith & Frith (1997b), Gilliard (1969), Hartert (1910), Mack & Wright (1996), Mayr (1931c), Mayr & Rand (1937), Pratt (1984), Schodde & Hitchcock (1968).

8. Curl-crested Manucode

Manucodia comrii

French: Paradisier d'Entrecasteaux **Spanish**: Ave-del-paraíso de Comrie
German: Kräuselparadieskrähe
Other common names: Curl-breasted Manucode

Taxonomy. *Manucodia comrii* P. L. Sclater, 1876, Huon Gulf; error = Fergusson Island, D'Entrecasteaux Archipelago, New Guinea.
May form a superspecies with *M. chalybatus*. Sympatric with *M. keraudrenii* on islands of Goodenough, Fergusson and Normanby, but hybridization unrecorded. Races poorly differentiated; species perhaps better treated as monotypic. Two subspecies currently recognized.
Subspecies and Distribution.
M. c. trobriandi Mayr, 1936 – Trobriand Group (Kiriwina and Kaileuna), off SE New Guinea.
M. c. comrii P. L. Sclater, 1876 – D'Entrecasteaux Archipelago (Goodenough, Wagifa, Fergusson, Dobu and Normanby), off SE New Guinea.



Descriptive notes. 43 cm; one male 448 g and one female 418 g (nominate). Large paradisaeid with crown feathering distinctively curled and that of neck crinkled; tail fairly long and graduated, terminal third of central pair of feathers twisted to expose underside. Has head, neck, mantle, back and rump deep blue-black, all tipped with iridescent yellowish-green with deep blue and/or violet-purple and magenta sheens; brighter iridescent tips against black feather bases form barring on mantle and back; blue-black upperwing and lesser upperwing-coverts glossed iridescent green-blue, tipped black, and remainder of coverts iridescent violet-purple with strong magenta sheen and feathers edged blue; primaries blackish, purplish-blue sheen on outer webs and tips; blue-black uppertail glossed purple and with strong magenta sheen throughout, rectrices with tiny hair-like central points; breast and remaining underparts dark blue-black, contrasting with iridescent broad purple/magenta feather tips (with some deep blue to green-blue sheens); iris dull red or red-orange; bill dark grey to black, legs black. Sexes alike in plumage, female on average the smaller. Newly fledged juvenile bare-headed, except for fine central crown line of matt black feathers, for weeks after leaving nest, also has extensive bare blue-black facial skin (giving odd appearance), fluffy soft plumage, matt black flank feathers, wing feathers glossed

blue, iris greyish-brown, bill blackish, legs pale yellow; immature like adult, but plumage less glossy, predominantly matt blackish, throat and breast feathers not crinkled and curved, iris paler and more orange-brown, tiny gape pale pink, mouth bright pink. Race *trobriandi* differs from nominate only in having smaller wing and tail. Voice. Range of calls, usually a mournful, low-pitched, rolling "woodloodloodloodloodll", descending slightly; also described as almost pulse-like low even series of rapidly repeated soft and rounded "oo" notes. Low-pitched resonant "ko-ko-ko-ko-ko" may be given at any time of day, as may a less frequent metallic croak; a monotone whistle, louder and then softer, and a very rapid series of notes all at same pitch; also an apparent low "clacking" flock-cohesion call and a repeated exclamatory, nasal, scolding "ench" note. Occasionally sexes duet. A briefer high-pitched, more musical, rapidly descending call may be by female.

Habitat. All wooded habitats, from lowland to upper montane forests, also forest edges, woodland, savanna, beach-crest casuarina (*Casuarina*) woodland, secondary growth with larger trees about forest edges, neglected gardens, and occasionally mangroves. On Goodenough I, ranges up to at least 2000 m.

Food and Feeding. Little known. Only fruits recorded, but presumably invertebrates also taken. Forages alone, in pairs, and in small groups; also with *Paradisaea decora* on Fergusson I.

Breeding. Season at least Jun–Nov and Mar; nest-building recorded mid-Nov and egg-laying Mar and Jun–Oct; fledglings in Oct in D'Entrecasteaux Archipelago and on Kiriwina. Recent observation of display in late Sept involved 4–6 individuals perched 2–10 m apart in grove and leaning well forwards with fluttering half-raised wings and cocked and fanned tail, while calling. One nest an open loose structure of vinelets and twigs, and another (Trobriand Is) had a thick base with large thick leaves on outside and many pieces of rotten wood in middle of bottom layer; suspended in fork of tree branch, one nest 7·6 m above ground. Clutch 1–2 eggs. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species: present in D'Entrecasteaux and Trobriand Islands EBA. CITES II. Fairly common to abundant overall. In D'Entrecasteaux Archipelago abundant on Fergusson and Goodenough. Apparently less plentiful in Trobriand Is, where possibly threatened by habitat loss associated with increasing human population. Occurs in overgrown gardens, which constitutes all habitat on Kiriwina I. This species' feathers were used by Trobriand islanders for ceremonial adornment.

Bibliography. Bell (1970b), Clench (1978), Coates (1990), Frith (1998), Frith & Beehler (1998), Frith & Frith (1997b), Gilliard (1969), Gregory (2007), Jordan (1936), LeCroy & Peckover (2000), LeCroy *et al.* (1984), Peckover (1990), Schram (2000).

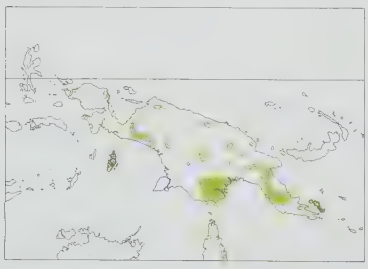
9. Trumpet Manucode

Manucodia keraudrenii

French: Paradisier de Keraudren **Spanish**: Ave-del-paraíso Trompetera
German: Trompeterparadieskrähe
Other common names: (Australian) Trumpetbird, (The) Manucode; Hunstein's Manucode (*hunsteini*)

Taxonomy. *Barita Keraudrenii* Lesson and Garnot, 1826, Dorey, north-western New Guinea.
Sometimes placed in a monotypic genus, *Phonygammus*. Sympatric with *M. ater*, *M. jobiensis* or *M. chalybatus* at various localities, but no cases of hybridization recorded. Race *hunsteini* has been considered possibly a separate species. Proposed race *mayri* (described from Wau, in NE New Guinea) synonymized with *purpureoviolaceus*, but may, like many other Huon Peninsula forms, prove to be distinct; further study required. Birds of Mamberamo R area not yet assigned to any subspecies. Nine subspecies currently recognized.

Subspecies and Distribution.
M. k. keraudrenii (Lesson & Garnot, 1826) – W New Guinea (Vogelkop, Onin Peninsula and Weyland Mts).
M. k. aruensis (Cracraft, 1992) – Aru Is.
M. k. jamesii (Sharpe, 1877) – lowlands of S New Guinea from Mimika R to Port Moresby, including islands in N Torres Strait (Boigu and Saibai).
M. k. neumanni (Reichenow, 1918) – N coastal ranges and scarp of Central Range from Bewani, Torricelli Mts and Lordberg E to Schrader Range and Jimi R and Baiyer R watersheds (Sepik–Wahgi Divide), in E New Guinea.
M. k. adelberti (Gilliard & LeCroy, 1967) – Adelbert Mts, in NE New Guinea.
M. k. diamondi (Cracraft, 1992) – S watershed of Eastern Highlands (from near Okapa, possibly including portions of Kratke Range), in E New Guinea.
M. k. purpureoviolaceus (A. B. Meyer, 1885) – uplands of SE New Guinea E from Kuper Range and Wau through Owen Stanley Range (distributional details not well delineated).
M. k. hunsteini (Sharpe, 1882) – D'Entrecasteaux Archipelago (Goodenough, Fergusson and Normanby).
M. k. gouldii G. R. Gray, 1859 – extreme NE Australia (NE Cape York Peninsula, and immediately adjacent Albany I and Mai I).



Descriptive notes. Male 31 cm, 130–240 g; female 28 cm, 130–182 g. Large paradisaeid with elongated feathers of nape and lower neck finely pointed, those above eyes forming conspicuous erectile occipital ear-tufts; fairly long tail slightly graduated. Male nominate race has head, neck and nape blue-black with green-blue iridescence, slight violet-purple sheen on rear crown; smooth-plumaged and iridescent blue mantle, back, rump, uppertail-coverts and uppertail with slightest yellow-green wash and heavy violet-purple sheen; rectrices with tiny hair-like central points at tips; intense iridescent deep violet-purple upperwing with indistinct blue sheen and edging on wing-coverts and tertials; blackish-brown primaries with narrow iridescent blue outer edges; iridescent oily green-blue upper breast, remaining underparts with purplish sheen, vent and undertail-coverts duller and less iridescent; iris red, fine inner ring of dark brown; bill and legs blackish to black; mouth blackish. Female is slightly smaller than male, somewhat duller on underparts, with head and neck hackles on average reduced in length, iris more orange. Juvenile is blackish with slight steely blue-green gloss, but no purple on back, wings or tail, elongate feathers scarcely indicated; immature dull blackish, particularly on head, with only slight bluish-green iridescence on upperparts and breast but duller on wings and belly (younger birds with iridescent sheen on underparts), iris greyish-brown to brownish-red to reddish-orange (redder with increasing age); brighter iridescent plumage and longer ear-tuft feathers gradually acquired with age. Race *jamesii* has throat and breast dark metallic blue, washed greenish, lacking purple of nominate, and with longer occipital tufts; *aruensis* is less green than nominate, differs from previous in being darker and bluer, less green, upperparts (particularly back) suffused purple, lanceolate head feathering more cobalt-blue, occipital tufts much shorter (similar in length to nominate); *neumanni* is like similar-sized nominate, but lower back, rump, tail and upperwing dark blackish-blue, washed iridescent violet-purple (rather than greenish), breast and belly dark metallic blue, occipital tufts on average shorter than all races except *adelberti* (tufts of which comparable in length); *adelberti* differs from nominate in having short occipital tufts and greenish (not blue or purple) upperwing and tail; *purpureoviolaceus* is like nominate but larger, with back, breast and belly iridescent violet-purplish, and occipital tufts far longer; *diamondi* is similar to previous, but distinct in having back, upperwing and tail with strong violet-purple sheen, breast and belly dark metallic blue with little or no violet-purple, and lanceolate head feathering bluish-green (as opposed to greenish-blue) washed violet-purple, occipital tufts slightly longer (thus longer than in all other races); *hunsteini* is larger than all preceding races, with longer occipital tufts that are less blue and more green, and back, rump and uppertail dark bluish-purple (less green); *gouldii* is like nominate, but iridescence more green (less purple), particularly so on upperwing and tail, occipital-tuft feathers more narrowly pointed and much longer, also relative tail length much longer. Voice. Large repertoire, with some sex-specific calls and racial variation. For example, *jamesii* male gives clear "whuu-oh" song, also sheep-like "maaah", displaying male a far-carrying hoarse "chauw, cher au-au-au-auw, chau-auw", other calls (sex unknown) include "chauw" or "chauw-chauw" often accompanied by rolling "chooo-roooo" or long drawn-out "krrrrooooo"; calls of *adelberti* described as forceful rasping "ha...", clear and ringing "who!", display song a whistled far-carrying note like that of peacock (*Pavo*), and a courting male described as giving a "hrarrr" call followed by almost bell-like, musical downslurred, slightly nasal "oo" or "kyeu" like that of a pigeon (Columbidae); "kyoup!", "cawwp!" and "geoaw!" noted for *purpureoviolaceus*; "scowlp", "scowlk" or "kwolk" for *gouldii*. Pair-members commonly call back and forth while foraging. Male nuptial song of upland population *purpureoviolaceus* a hollow, low, reverberating and tremulous single note, "wodldldldldldldl", at even pitch, sometimes preceded by "kaup" note. Presumed male *gouldii* gives repeated "skowlp" notes for periods of c. 30 seconds or more during early breeding season, possibly as nest-site advertisement. Nesting pair in Australia produced a strong, brief, "creaking-door" alarm call, rather like that of cicada (Cicadidae) but deeper.

Habitat. Lowland rainforest, hill forest and middle montane forest; inhabitant of rainforest interior, rarely at forest edge or in second growth. Found at 200–2000 m, mainly 900–1800 m, throughout most of New Guinea range; some New Guinea races primarily lowland-dwelling, others in hill and middle montane forests. In Australia, lowland forests, occasionally in mangroves, and on small offshore islands.

Food and Feeding. Mostly fruits, especially figs (*Ficus*); also invertebrates, including insects, spiders (Araneae), small gastropods. Nestling diet at one nest at least 90% fig pieces. Forages mostly in middle to upper levels of forest. Fruit-foraging birds consist of a pair, or aggregations of up to ten in trees. On lower mountain slopes occurs in mixed-species foraging flocks, including female-plumaged *Paradisaea* and flocks based upon New Guinea Babblers (*Pomatostomus isidorei*) and Rusty Pitohuis (*Pitohui ferrugineus*).

Breeding. Season at least May–Jan over entire range; males with enlarged gonads in Feb–Apr and Jul–Dec and females in Jun and Oct–Nov; displays noted May and Aug, and calls thought indicative of display produced in all months; copulation seen in mid-Nov. Monogamous pair-bonding, some pairs persist for more than one season; non-territorial. Display solitary, in tree branches, involves a chase, frontal lunging display, opening of wings, raising of fanned tail, erection of neck hackles, and loud harsh call. Nest is an open basin-shaped structure of curly vine tendrils, lined with fine creeping fern tendrils, sparser than in those of congeners and lacking larger leaves or pieces of dry wood; suspended 6–27 m above ground in horizontally forking tree branch, around which vine tendrils of nest rim entwined; nesting association with pairs of Black Butcherbirds (*Cracticus quoyi*) recorded in Australia. Clutch 1–2 eggs; incubation performed by both parents, and both also brood and feed the nestlings; no information available on duration of incubation and nestling periods.

Movements. Presumed resident.

Status and Conservation. Not globally threatened. CITES II. Locally fairly common. Distribution in mainland New Guinea patchy as a result of restriction to particular altitudinal zone in certain ranges; some populations isolated in smaller ranges on N coastal New Guinea. Recently found to be uncommon and patchily distributed in Aru Is. Sparse in fragmented and limited habitat in NE Australia. In New Guinea, estimated density (based on transect counts) near Port Moresby 5 birds/10 ha; home range 200 ha or more on Mt Missim (E New Guinea), with high degree of overlap by individuals.

Bibliography. Barnard (1911), Barrett *et al.* (2003), Beehler (1978b, 1983a, 1985, 1989a), Bell, H.L. (1977, 1982c, 1984a), Coates (1990), Cracraft (1992), David & Gosselin (2002b), Diamond (1972, 1987b), Frith, C.B. (1994a, 1994b), Frith, C.B. & Beehler (1998), Frith, C.B. & Frith (1993d, 1997b), Frith, D.W. & Frith (1995), Gilliard & LeCroy (1967a), Gregory (1995), Greenway (1935), Harrison & Frith (1970), Hartert (1930), Higgins *et al.* (2006a), MacGillivray (1914), Mayr & Rand (1937), North (1901), van Oort (1909), Pavesi (1875), Pratt & Stiles (1983), Rand (1938c), Rosenberg (1875), Salvadori (1896), Schodde & Mason (1999).

Genus *PARADIGALLA* Lesson, 1835

10. Long-tailed Paradigalla

Paradigalla carunculata

French: Paradisier caronculé **Spanish**: Ave-del-paraíso Carunculada
German: Langschwanzparadigalla
Other common names: Wattled Bird-of-paradise

Taxonomy. *Paradigalla carunculata* Lesson, 1835, Arfak Mountains, New Guinea.
Forms a superspecies with *P. brevicauda*, and was in the past sometimes considered conspecific. Intergeneric hybridization with *Parotia sefilata*, *Lophorina superba* and *Epimachus fastosus* documented. Monotypic.

Distribution. Vogelkop (Arfak Mts), and apparently also Onin Peninsula (Fakfak Mts), in NW New Guinea.

Descriptive notes. Male 37 cm, female 35 cm; one female 170 g. Fairly large paradisaeid with prominent facial wattles, strongly graduated tail; on folded wing, longest secondaries may extend to primary tips. Male has bright yellow to greenish-yellow foreface wattle originating at base of upper mandible, and small swollen sky-blue wattle on lower mandible base, beside which a small



area of orange-red bare skin; velvety jet-black head and neck, oily bluish-green iridescence on head feathering, more greenish-blue on scale-like feathering of crown and nape; velvety jet-black from mantle down to uppertail-coverts, upperwing-coverts, tertials, secondaries and central pair of tail feathers with slight dark purple hue overwashed with rich olive-green iridescent sheen; primaries and outer (shorter) tail feathers dark brownish-black with slight olive-green sheen on outer edges; tail feathers (other than central pair) terminally notched, with tiny hair-like central points; upper breast to undertail-coverts dark brownish-black with coppery-purple iridescent sheen; iris dark brown; bill shiny black; legs blackish. Female is like male but paler, duller and smaller, with mean wing length notably shorter. Juvenile undescribed; immature like adult but duller-plumaged, with shorter tail. VOICE. No information available.

Habitat. Middle montane forest amd forest edge; elevational range poorly defined, probably c. 1400–2100 m.

Food and Feeding. Little known; eats fruits.

Breeding. Virtually unknown. Given that it hybridizes with three other genera, and from what is known of its sole congener *P. brevicauda*, present species assumed polygynous, with male solitary and promiscuous; a "pair" recorded at 1725 m during Jul–Aug 1994 was presumably an adult female with offspring.

Movements. No information.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in West Papuan Highlands EBA. CITES II. Very poorly known; few records, predominantly of specimens collected in Arfak Mts, where possibly not uncommon. A paradigalla seen in Fakfak Mts (in Onin Peninsula) was presumably of this species. Thought likely to have moderately small and fragmented population; possibly occurs on other mountain ranges in Vogelkop, but no confirmed records. Although probably secure in most of its range, may be suffering local declines owing to forest loss. Within its small range extensive forests still generally undisturbed owing to geographical isolation and low density of human population and traditional lifestyle of latter, although deforestation occurring in hills. Efforts should be made to document distribution and abundance of this little-known species. One large protected area exists in Arfak Mts, and proposal to extend this has been made.

Bibliography. Anon. (2008j), Butchart & Stattersfield (2004), Collar *et al.* (2001), Frith & Beehler (1998), Frith & Frith (1997a, 1997b), Gibbs (1994), Gyldenstolpe (1955a), Hartert (1930), Hartert *et al.* (1936), McCarthy (2006), Stattersfield & Capper (2000).

11. Short-tailed Paradigalla

Paradigalla brevicauda

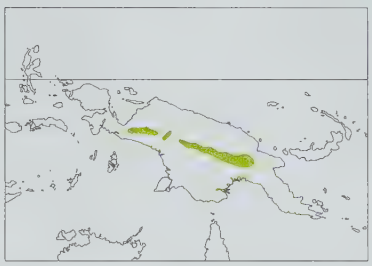
French: Paradisier à queue courte **Spanish**: Ave-del-paraíso Colicorta
German: Kurzschwanzparadigalla

Other common names: Short-tailed Wattled Bird, Blue-and-yellow Wattled/Short-tailed Bird-of-paradise

Taxonomy. *Paradigalla brevicauda* Rothschild and E. J. O. Hartert, 1911, Mount Goliath, central New Guinea.

Forms a superspecies with *P. carunculata*, and was in the past sometimes considered conspecific. Birds from Utakwa R, at c. 1500 m in Nassau Range (WC New Guinea), described as race *intermedia*, but considered inseparable from birds in rest of species' range. Monotypic.

Distribution. C ranges of New Guinea from Weyland Mts E to Mt Karimui and Bismarck Range.



Descriptive notes. Male 23 cm, 160–184 g; female 22 cm, 155–170 g. Male has bright yellow foreface wattle originating at base of upper mandible, and smaller swollen sky-blue wattle on base of lower mandible; velvety jet-black head, neck and entire upperparts, with oily yellowish-green iridescence on head feathering, more apparent on scale-like crown and nape; mantle and back with slight purple hue overwashed with silk-like olive-green sheen; oily olive-green silk-like sheen on rump, uppertail-coverts, upperwing (mainly as broad leading edges of primaries and secondaries), and central pair of tail feathers (mean length of central pair 3 mm shorter than mean length of remaining rectrices); primaries and remaining tail feathers blackish-brown, rectrices with fine hair-like central points; jet-black breast and remaining underparts suffused with darkest brown and with slightest iridescent sheen of dark coppery purple; iris dark brown; bill black, mouth pale aqua-blue; legs purplish lead-grey. Tail much shorter than that of *P. carunculata*. Female is like male but smaller, with longer tail, also duller, more brownish, the black and iridescence being more subdued. Juvenile is similar to female but uniformly duller (unlike barred young of most Paradisaeinae), lacking iridescence or sheen, and facial wattles pale whitish-yellow; immature of both sexes has tail considerably longer than adult, tail becoming progressively shorter with age. VOICE. Little known. Calls recorded include melodic "hui", also high-pitched mournful whistling of 4 clear ascending notes, the last prolonged and rising in pitch; throaty croak; melodious "hoo ee", and a "churr churr churr" similar to, but quieter than, that of *Lophorina superba*; also a loud rising "zheee".

Habitat. Middle montane forests, including southern beech (*Nothofagus*), secondary growth, also forest edge and edges of gardens; 1400–2580 m, mainly 1600–2400 m.

Food and Feeding. Fruits; also epiphyte-dwelling animals, including insects, spiders (Araneae), worms (Annelida), frogs (Anura), skinks (Scincidae). A single nestling was fed c. 65% animal items, including beetles (Coleoptera) and other arthropods, frogs, skinks. Forages usually in middle and upper strata of forest, but also near ground. Prey taken from trunks, boughs, bark and moss. Encountered singly.

Breeding. Recorded in all months except Mar and Nov in one area; egg-laying Jan, Apr–Jul, Sept–Oct and Dec; one record of nest-building early Sept in Ambua Range. Assumed polygynous, with male promiscuous and solitary; female builds and attends nest alone. Birds giving "zheee" call spaced at intervals of c. 150 m in moss forest in Ambua Range, suggestive of males advertising from songposts. Nest a substantial cup or bowl-shaped structure lacking sticks, exterior of green mosses, fern fronds and small-leaved epiphytic/climbing plants, including orchids (some living), within this entwined woody vine tendrils entirely circling nest rim and outside several supporting branches, inner lining of dry leaves, small egg-cup lining of fine dark wire-like tendrils; placed 5–11 m above ground in branching fork in well-foliaged sapling or larger tree at forest edge or in garden isolated from immediate vegetation; habitual use of nest-site and tree recorded, and one female nested in same immediate area for at least seven years. Clutch 1 egg, same female recorded laying during different seasons; incubation more than 20 days; removed and ate chick's faeces, nestling period at one nest 25 days; female seen to feed immature (of her own size, but with duller plumage, less pure yellow facial wattles) for 108 days, but apparently ceased doing so a week later.

Movements. Presumed resident.

Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. CITES II. Widespread, but patchily distributed; common in some localities, but uncommon over most of range. Commonly seen but not numerous about Sogolomik, Ok Tedi, Papua New Guinea. An individually marked female in Ambua Range attended six different nests within area of less than 200 m² over period of 29 months.

Bibliography. Coates (1990), Frith (1970b), Frith & Beehler (1998), Frith & Frith (1992b, 1997a, 1997b), Gilliard & LeCroy (1961), Gregory (1995), Gyldenstolpe (1955a), Hicks, R.K. & Hicks (1988), Mayr (1941), Mayr & Gilliard (1954), Ogilvie-Grant (1915), Rand (1942b).



PLATE 22

inches 5

cm 13

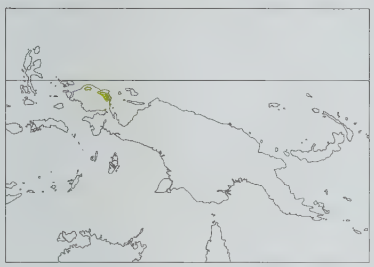
Genus *ASTRAPIA* Vieillot, 1816

12. Arfak Astrapia

Astrapia nigra

French: Paradisier à gorge noire **Spanish**: Ave-del-paraíso de las Arfak
German: Fächerparadieselster
Other common names: Great/Black/Gorget Astrapia, Arfak/Great/Black/Gorget Bird-of-paradise, Long-tailed Astrapia/Bird-of-paradise

Taxonomy. *Paradisea nigra* J. F. Gmelin, 1788, "Oceanic Islands"; error = Arfak Mountains, New Guinea.
Intergeneric hybridization with *Epimachus fastosus* recorded. Monotypic.
Distribution. Vogelkop (Tamrau Mts and Arfak Mts), in NW New Guinea.



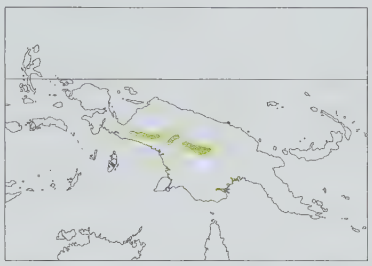
Descriptive notes. Male 60 cm (76 cm with central rectrices included), female 50 cm. Large astrapia with extremely long, markedly graduated tail. Male has velvety jet-black head with blue to purple iridescence, crown and side of face with coppery-bronze wash, especially on larger scale-like nape feathers; obvious "cape" from central nape to mantle consisting of large metallic yellowish-green scale-like feathers with purple-blue to mauve sheen, contrasting with elongate plush velvety jet-black feathers (with dull blue to magenta sheen) on each side; back to uppertail-coverts sooty brownish-black with dark coppery olive-green iridescence; exposed upperwing and uppertail sooty black with violet-purple sheen, blue and/or magenta iridescence; black malar area, chin and throat feathers with velvety iridescent blue with purple and/or magenta wash; elongate dense feathers of upper breast velvety jet-black with dull coppery violet-purple iridescence in some lights, bordered below by broad gorget of iridescent bronzed coppery feathers, and/or lime-green, this extending up side of breast and malar area to beneath eye; remaining underparts dully iridescent dark green, with large and broad scale-like feather tips down sides of lower breast and belly iridescent cyan and/or sky-blue; blackish-brown undertail-coverts; iris dark brown; bill shiny black; legs brownish-black. Female is smaller than male, notably in wing and tail, radically different plumage, with black head and nape glossed iridescent dark blue, iridescent blue of nape grading into upper mantle; rest of plumage drab blackish-brown on upperparts and down to chest, below dusky brown, narrowly barred buff. Juvenile is fluffy, less blackish than immature, dorsal surface of tail as on older female-plumaged birds; immature male like adult female but tail on average longer, after first year little to no paler barring below except lower belly to undertail-coverts; subadult male varies, like adult female but with few feathers of adult male plumage intruding, to like adult male but with few feathers of female-like plumage remaining, length of central pair of rectrices increases progressively with age while that of other rectrices decreases. Voice. Male relatively silent; single record of simple double downslurred hollow "clu-ck".
Habitat. Montane and subalpine forests, presumably to apex of Arfak Mts; 1700–2250 m.
Food and Feeding. Little known. Diet fruits and arthropods, but relative proportions unknown.
Breeding. Female-plumaged individual feeding juvenile of similar appearance in mid-Jul and juveniles at Tanah Merah (Arfak Mts) in Jul–Aug. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in West Papuan Highlands EBA. CITES II. Most records from Arfak Mts; a single sighting in Tamrau Mts. Said to be common enough, but adult males rarely encountered, in 1872; little recorded since then. In view of its limited range, this species could be, or become, vulnerable. Field studies required.
Bibliography. Frith & Beehler (1998), Frith & Frith (1997b), Hartert (1930), Heads (2002), McCarthy (2006), Sharpe (1891–1898).

13. Splendid Astrapia

Astrapia splendidissima

French: Paradisier splendide **Spanish**: Ave-del-paraíso Espléndida
German: Prachtparadieselster
Other common names: Splendid Bird-of-paradise

Taxonomy. *Astrapia splendidissima* Rothschild, 1895, "Probably Charles-Louis Mountains" = Weyland Mountains, New Guinea.
Possible hybridization with *A. mayeri* in E of range, but no confirmed records of such. Species sometimes treated as monotypic, but race *helios* considered sufficiently distinctive to warrant recognition. E extent of distribution uncertain. Two subspecies recognized.
Subspecies and Distribution.
A. s. splendidissima Rothschild, 1895 – Weyland Mts and Charles Louis Range E to L Paniai (Wissel Lakes), in W New Guinea.
A. s. helios Mayr, 1936 – from E of L Paniai E to Hindenburg Mts and at least to Victor Emanuel Range.
Descriptive notes. Male 39 cm, 120–151 g; female 37 cm, 108–151 g. Medium-sized astrapia with long, markedly graduated tail. Male nominate race has brilliantly iridescent metallic yellowish-green crown, nape and mantle, metallic blue-green chin and throat with blue to purple sheen in suitable lights; velvety black back with rich magenta sheen, matt black rump and uppertail-coverts; dark greyish-brown upperwing, slight purplish-blue iridescence at leading edge (above primary coverts); rectrices blackish-brown, inner four pairs with variable extent of white on bases and shafts, central pair having black broad spatulate tips with slight iridescent magenta gloss, tail feathers with tiny hair-like central points at tips; broad, strongly iridescent coppery-red gorget narrowing as it extends up breast side to side of face to beneath eye; remaining underparts silk-like oily dark green, with some larger plate-like feathers at breast side with strong, paler, lime-green iridescence; matt blackish-brown thighs, vent and undertail-coverts; iris dark brown to blackish-brown; bill



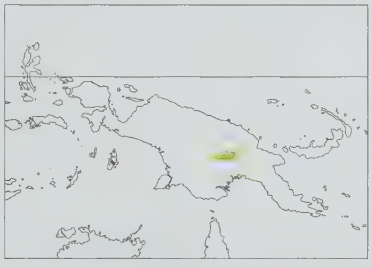
shiny black; legs fleshy lead-grey. Female is smaller than male, radically different plumage, head, nape and throat brownish-black with bluish-green iridescent gloss, drab blackish-brown on upperparts down to chest, below finely barred dusky brown and buff. Juvenile is like female but plumage soft and fluffy, duller and less black above, less rufous in underparts, more grey on chin, throat and upper breast, and tail feathers more pointed; immature like adult female but dark chestnut-brown on crown, sometimes with variable amount of chestnut-rufous in crown; subadult male varies, like adult female but with few feathers of adult male plumage intruding, to like adult male with few feathers of female plumage remaining, initial part of adult plumage acquired is glossy green feathering on crown and throat; male tail becomes progressively shorter with age. Race *helios* is larger than nominate, has extensive, unconcealed white bases on underside of outer primaries (except outermost two), adult male more bluish and less golden-green on crown, neck and dorsal collar, broader spatulate tips on central pair of rectrices, female-plumaged birds slightly darker above. Voice. Male produces nasal insect-like "to-ki", second note rising; similar "teek-teek" given by female-plumaged individual. Other calls include sharp, softly delivered, pathetic "jeet" (in Jayawijaya Mts, in EC part of range); curious clicking "tch tch tch"; frog-like dry "gree" note (at Tembagapura, in W of range); distinctive yelping call; and mechanical/metallic whirring vocalization.
Habitat. Montane and subalpine forests to tree-line, also forest edge and associated secondary growth; 1750–3450 m, mainly 2100–2700 m.
Food and Feeding. Mostly fruits; also animals, including arthropods, frogs, lizards. Forages from canopy down to undergrowth, taking items on moss-covered tree trunks and limbs. Generally solitary, but also in pairs and trios.
Breeding. Nest-building recorded in Mar, juvenile seen in Aug, egg in Oct and nestling in Nov. Observation of four calling adult males perched on exposed branches near tops of tall trees at regular intervals (c. 40 m) around forested edge of natural meadow suggests possibility of lekking behaviour. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. CITES II. Common and widespread in Okbap area of Star Mts (in E of range) at c. 2600–3200 m, whereas only female-plumaged individuals at lower elevations down to c. 2150 m. Little demand for plumes reported in Ilaga Valley and Victor Emanuel Range in 1960s. Not presently under any significant threat.
Bibliography. Cracraft (1992), Junge (1953), Frith (1995b, 1998), Frith & Beehler (1998), Frith & Frith (1997b), Gilliard (1961, 1969), Gilliard & LeCroy (1961), Hartert *et al.* (1936), Rand (1942b), Rothschild (1931), Tolhurst (1989).

14. Ribbon-tailed Astrapia

Astrapia mayeri

French: Paradisier à rubans **Spanish**: Ave-del-paraíso Cuelgacintas
German: Schmalschwanz-Paradieselster
Other common names: Ribbon-tailed Bird-of-paradise, Ribbon Tail

Taxonomy. *Astrapia mayeri* Stonor, 1939, Mount Hagen, New Guinea.
Intrageneric hybridization with *A. stephaniae* recorded; possible hybridization with *A. splendidissima* in W of range, but no confirmed records of such. Monotypic.
Distribution. From Doma Peaks, upper Strickland R, Muller Range and Karius Range E to Porgera/Mt Liwaro highlands, Mt Hagen and Mt Giluwe.



Descriptive notes. Male 32 cm (125 cm with central rectrices), 134–164 g; female 35 cm (53 cm including central rectrices), 102–157 g. Medium-sized astrapia with short, narrow and sharply pointed graduated tail, with central pair of rectrices extraordinarily elongated. Male has entire head, including narial tuft above base of upper mandible, velvety jet-black, intensely iridescent metallic yellowish-green and/or blue and violet-purple and/or magenta in some lights, notably on ear-coverts and on elongate feathers at side of head to nape; velvety jet-black from mantle to uppertail-coverts with iridescent sheen of bronzed olive-green, lesser upperwing-coverts darkest matt brownish-black edged jet-black, greater coverts and alula brownish-black, flight-feathers blackish-brown; uppertail blackish-brown, central feather pair grossly elongated (more than 1 m) into two cotton-white "ribbons" (c. 2 cm broad), each with 3–4 cm at tip blackish-brown, and shaft blackish for terminal quarter; intense metallic yellowish-green throat feathers, tending to slightly scale-like appearance, extending onto upper breast and sharply meeting broad area of velvety jet-black breast feathers with dull iridescent copper-bronze sheen, this bordered below by extensive narrow gorget of iridescent coppery red; remaining underparts iridescent coppery red, broken up by exposed iridescent green bases; vent and undertail-coverts matt brownish-black; iris dark brown; bill blackish, mouth pale greenish-yellow; legs dark leaden blue-grey. Female is smaller than male (no overlap in lengths of wing and central rectrices), radically different plumage, entire head and nape jet-black with iridescent metallic bronzed yellowish-green (more so on older individuals) and/or blue in some lights, blue iridescence more obvious on sides of face and lower throat, with mantle and back velvety blackish and (in some lights, rarely) with dark blue and/or violet-purple to magenta sheen; rest of plumage overall drab blackish-brown, but abdomen rufous to buff-brown with fine blackish barring. Juvenile is like adult female but duller, barred ventral plumage less brown, also soft and fluffy; immature like adult female, but wing and tail (excluding central pair) on average longer; first-year like adult female but iridescence duller, subsequently becoming more like adult female with increasing age; subadult male variable, like adult female with few feathers of adult male plumage intruding, to like adult male but with few

On following pages: 15. Stephanie's Astrapia (*Astrapia stephaniae*); 16. Huon Astrapia (*Astrapia rothschildi*).

female-like feathers remaining, central pair of rectrices shorter than on adult male but remainder of tail significantly longer; with increasing male age central pair of rectrices progressively longer as other rectrices become progressively shorter, one male taken into captivity took at least six years to acquire full adult plumage. Voice. A common call a loud clear "waugh", or "wock, whit-whit" in which first note guttural and immediately repeated second one sharply whistled. Other calls include "kenk!" and scolding "skaw skaw" by adult male; plaintive, nasal, frog-like, single or double "wreden", "kuweep werwer", "reaou reaou" or "wreden weep" by short-tailed immature male; and harsh "hisss-sss-ssh" followed by loud sharp "keaoo-ooo-ooo" by displaying male jumping from branch to branch.

Habitat. Upper montane and subalpine moss forests, forest edge, isolated forest patches, and selectively logged and otherwise disturbed forest; 1800–3450 m, mostly above 2450 m.

Food and Feeding. Mostly fruits, especially of *Schefflera*, also arthropods, spiders (Araneae), frogs (Anura). Forages mostly in upper third of forest, but also lower, down to ground. Probes for animals among mossy or other epiphyte-covered tree boughs, trunks, branches/foliage and pandanus (*Pandanus*) frond bases; uses open-bill-probing in dead branches and accumulated vegetable debris. Usually alone, sometimes two together (one of which may be adult male), or group of 3–7 individuals in female-like plumage.

Breeding. Breeding recorded in all months except Apr; egg-laying May, Jun and Sept–Feb; displays noted Jun, Aug and Dec. Polygynous, with apparently lekking promiscuous males advertisement-singing/displaying from traditional perches; female builds and attends nest alone. In courtship, one or more males jump back and fourth between tree branches, tail ribbons held up and arched and wings drooped, but little else known; display-flight enhances white rectrices and produces significantly louder wing noise than in usual flight. Nest a frail to substantial deep cup of large leaves and pandanus frond pieces, sparsely to densely covered with fresh green-leaved epiphytic orchid stems that are denser around nest-cup circumference and outer rim, sometimes odd piece of small fern frond used externally, egg-cup lined with much finer dead, straw-like, supple leafless orchid stems; placed mostly in near-vertical forking branch 3–18 m above ground in isolated small tree or tree-fern, often in secondary growth; nest-site repeatedly reused. Clutch 1 egg; incubation period 21 days (in captivity, one nest); nestling period 25–29 days.

Movements. Presumed resident.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Central Papuan Mountains EBA. CITES II. Fairly common to locally abundant; female-plumaged individuals far more numerous than adult males. In W of range recently found at new site, Kumul Lodge, where reported as being abundant. Thought likely to have fairly small population within small global range; probably declining owing to continued habitat degradation, but range not yet severely fragmented. Able to survive in degraded forest. Threatened locally by hunting for tail plumes, also by large-scale logging and forest degradation, but not at immediate risk as much of its range is uninhabited or inaccessible. Previous concerns of genetic swamping through hybridization with *A. stephaniae* in extreme E of range now discounted.

Bibliography. Anon. (2008j), Boehm (1967), Butchart & Stattersfield (2004), Coates (1990), Diamond (1972), Everitt (1973), Frith & Beehler (1998), Frith & Frith (1992a, 1993a, 1993b, 1997b), Gilliard (1969), Kuroda (1943), Kwapena (1985), Mayr & Gilliard (1952), McCarthy (2006), Shaw Mayer & Peckover (1991), Stattersfield & Capper (2000).

15. Stephanie's Astrapia

Astrapia stephaniae

French: Paradisier de Stéphanie **Spanish**: Ave-del-paraiso de Estefania
German: Stephanieparadieselster

Other common names: Princess Stephanie's/Stephanie Bird-of-paradise, Princess Stephanie Astrapia

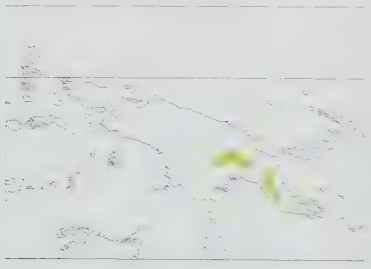
Taxonomy. *Astrarchia stephaniae* Finsch and A. B. Meyer, 1885, Hufeisengebirge [Horseshoe Mountains = Mount Maguli], south-eastern New Guinea.

Extensive hybridization with *A. mayeri*, in W of range (from Doma Peaks E in narrow zone of altitudinal overlap to Mt Hagen/Mt Giluwe). Races poorly differentiated; additional proposed race *ducalis* (described from Dawong, in Herzog Mts) synonymized with nominate. Two subspecies recognized.

Subspecies and Distribution.

A. s. feminina Neumann, 1922 – Schrader Range, Bismarck Range and Sepik–Wahgi Divide, in E New Guinea.

A. s. stephaniae (Finsch & A. B. Meyer, 1885) – Doma Peaks, Mt Hagen and Mt Giluwe E (including Mt Ialibu, Kubor Range, Mt Karimui, Mt Michael, and Kratke and Herzog Ranges) to SE Owen Stanley Range (Mt Dayman).



Descriptive notes. Male 37 cm (84 cm with central rectrices included), 144–169 g; female 53 cm, 123–159 g. Medium-sized astrapia with large graduated tail, rectrices other than central pair broad and square-ended, central pair extraordinarily elongated. Male nominate race has head velvety jet-black, with cobalt-blue and/or violet-purple and magenta iridescence on crown and extensively on to nape and side of face; upperparts velvety jet-black with strong iridescence of bronzed lime-green; upperwing jet-black, strong iridescent violet-purple and/or magenta sheen on greater coverts, on outer edges of flight-feathers and on tertials; uppertail blackish-brown with slightest coppery sheen, except for greatly elongated velvety jet-black central feather pair with iridescent violet-purple and/or magenta sheen and conspicuous white central feather shafts for basal third of their length; chin to upper breast metallic bluish-green, this extending to upper breast and meeting broad area of velvety jet-black breast feathers with dull iridescent copper-bronze sheen, bordered below by extensive narrow gorget of iridescent coppery red; rest of underparts iridescent coppery red, broken up by exposed iridescent green bases; vent and undertail-coverts dull brownish-black; iris dark brown; bill shiny black, mouth pale green or lime-green; legs purplish leaden grey. Differs from *A. mayeri* mainly in lack of narial tufts, and in having iridescence on head more cobalt-blue and more extensive (to side of face), iridescence on upperparts stronger and paler, upperwing darker, feathers of chin to upper breast more bluish-green and finer, more silky (not tending to scale-like), rectrices other than central pair much larger, broad and square-ended (not shorter, narrow and sharply pointed), and central pair jet-black. Female is smaller than male, radically different in plumage, overall drab blackish-brown on head, upperparts and down to chest, below which rufous to blackish with fine blackish barring; bluish iridescence on head. Juvenile is black above, with variable amount of rich rufous nape feathering that may extend on to rear crown, buff with blackish barring below, plumage soft and fluffy, iris brown-grey; immature like adult female; first-year male may still have some rufous in nape, with iridescence initially on forehead, crown and chin, subsequently entire head, throat and upper breast with iridescence, thereafter more of adult male plumage acquired; subadult male variable, like adult female with few feathers of adult male plumage intruding to like adult male with few female-like feathers remaining; with increasing age, central pair of rectrices progressively longer as other rectrices become progressively shorter. Race *feminina* is like nominate but slightly smaller, wing on average slightly shorter, less contrast between colour of crown nape and that of back, male crown and nape more bluish-black. Voice. Little noted; male not known for loud advertisement. Call of male described as "nge, nge, nge" and, more softly, "ss, ss, ssw, ssw", and that of female as a squeaking note. Also rapid, drawn-out, harsh notes sometimes followed by "hoo-hee-hoo-hee..." (like that of a *Melidectes* honeyeater), given simultaneously by several individuals.

Habitat. Middle montane, upper montane and subalpine forests, including forest edge, selectively logged forest, and other disturbed forest mixed with secondary growth; 1280–3500 m, mainly 1500–2800 m.

Food and Feeding. Mostly fruits, especially of *Schefflera*, also insects, spiders (Araneae), frogs (Anura), skinks (Scincidae). Forages mostly in middle and upper forest strata. Animal prey taken from limbs and moss; employs open-bill probing. Usually forages singly, or in small loose groups of two or three and sometimes up to six individuals; will join mixed-species flocks with *Epimachus meyeri*.

Breeding. Breeding recorded at least May–Dec; egg-laying Jun and Oct–Dec, and fledglings observed Jul (Mt Giluwe) and Nov (Ambua Range); males with moderately to greatly enlarged gonads in all months, more so Mar–Oct, and female gonadal activity Jun–Aug and Oct–Dec; display season Jul–Sept near Jimi R and Nov–Dec on Mt Giluwe (courtship peak during dry season, but males may display all year). Polygynous, lekking promiscuous males sing and display on traditional perches, females build and attend nest alone; communal displays at leks of at least 2–5 males (four leks at nearest-neighbour distance c. 1·5–2 km, on crest or side of steep-sided ridges), each lek of 4–7 trees c. 25 m tall, one or two of which are main display tree(s); when adult males arrive, two or three perch at each end of a display limb to display and swap places from one end of perch to other; males (1–5, average 3) gather at lek shortly after dawn and remain for c. 2 hours. In courtship, male chases a female about branches and displays by hopping back and forth between branches of display tree, or between trees, calling occasionally; one male displaying stimulates others to do so. Few nests found; varies from being a large and bulky structure, mostly of epiphytes, to being a thick shallow structure of large leaves and creepers, lined with root fibres, small leaves and bark debris, said to be like those of *Parotia lawesii* and *Lophorina superba*; two nests were built c. 10 m up in forked tree branch, a third c. 4 m above ground in climbing bamboo. Clutch 1 egg; in captivity, incubation 22 days (in one nest) and nestling period 26–27 days (at two nests).

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. CITES II. Common in some areas; sparse in others with apparently suitable habitat. Decline noted between early 1960s and 1970s in upper Kaironk valley, possibly a result of plume-hunting. In view of this species' reasonably large range and elevational distribution, there is no reason to believe that it is likely to become at risk in foreseeable future.

Bibliography. Bishop & Frith (1979), Coates (1973a, 1990), Cracraft (1992), Diamond (1972, 1986a), Everitt (1973), Frith (1998), Frith & Beehler (1998), Frith & Frith (1997b), Gilliard (1969), Gilliard & LeCroy (1968), Goodfellow (1926a), Gyldenstolpe (1955a), Healey (1978b), Kwapena (1985), Majnep & Bulmer (1977), Mayr (1931c), Mayr & Gilliard (1954), Mayr & Rand (1937), McCarthy (2006), Schodde (1976), Sims (1956), Yealland (1969).

16. Huon Astrapia

Astrapia rothschildi

French: Paradisier de Rothschild **Spanish**: Ave-del-paraiso de Rothschild
German: Blaubrust-Paradieselster

Other common names: Rothschild's Astrapia/Bird-of-paradise, Huon Bird-of-paradise

Taxonomy. *Astrapia rothschildi* Foerster, 1906, Rawlinson Mountains, north-eastern New Guinea. Monotypic.

Distribution. Huon Peninsula (Finisterre Mts, Saruwaged Range, Cromwell Mts, Rawlinson Mts), in NE New Guinea.



Descriptive notes. Male 69 cm, 186–205 g; female 47 cm, 143–200 g. Large astrapia with exceptionally long, broad tail markedly graduated. Male has entirely black head and nape with green-blue iridescence, notably on fine scale-like crown feathers; iridescent dark green hindneck and mantle feathers are plate-like, forming distinctive cowl, exposed bases broadly tipped iridescent magenta, more coppery red against nape; blackish back with olive-green sheen, blackish rump; black upperwing with blue-purple sheen; uppertail velvety black with bluish-purple to pinkish-purple sheens; breast like head, bordered below by strongly iridescent distinct fine coppery-orange gorget; silk-like feathers of lower breast and belly oily dark green, some larger plate-like feathers down breast side strongly iridescent and paler, lime-green; matt brownish-black thighs, vent and undertail-coverts; iris dark brown; bill shiny black; legs fleshy lead-grey. Female is much smaller than male, with wing and tail significantly shorter; plumage radically different, with slightest of dull blue iridescent sheen on head and upper breast, otherwise entirely sooty black except for fine, inconspicuous pale barring on abdomen and undertail-coverts. Juvenile undescribed; immature like adult female but slightly larger, lacking pale nape barring, with abdomen barring much reduced, blue iridescence on head increasing and abdomen barring decreasing with age; subadult male varies, like adult female with few feathers of adult male plumage intruding to like adult male but with few feathers of female-like plumage remaining, with age head becomes increasingly iridescent and barring on underparts becomes obscured by increasing blackish plumage; all rectrices grow progressively longer with increasing male age. Voice. Calls, including muffled scolding "jj, jj" or "jiw, jiw", resemble those of *A. stephaniae*; an adult male gave a 5-note call more melodious than that of a *Parotia* scream, but not the yelp of *A. stephaniae*.

Habitat. Middle montane, upper montane and subalpine forests, at 1460–3010 m. Display trees located on broad crests of ridges, often at edge of windfall clearing.

Food and Feeding. Little known. Diet fruits and animals. Seeks animal prey by biting and tearing at mosses on branches and twigs, and inspecting or probing knotholes. Group of four or five female-plumaged individuals may forage together.

Breeding. Egg-laying at least Oct–Nov; male with moderately enlarged gonads Mar and Oct and female with enlarged gonads Mar and Aug; display recorded only 31st Jan to 7th Feb. Courtship display involves low-intensity erect posture with tail-fanning, and high-intensity inverted posture with various tail movements; between displays males hop back and forth between adjacent perches. Nest a firm shallow cup mostly of vines, rootlets and creepers on conspicuous foundation of large, strong, broad leaves and leaf pieces, leaf skeletons and moss, with odd pieces of moss on outside of structure (mostly on rim); one nest had some fine hair-like rootlets as egg-cup lining. Clutch 1 egg. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Restricted-range species: present in Adelbert and Huon Ranges EBA. CITES II. A little-known species; common at Ogeranang (Rawlinson Mts), at 1600 m, in 1977. Assumed not to be under any immediate threat, but very few data, and has limited range. Survey required of current distribution, habitats and status.

Bibliography. Crandall (1932), Draffan (1977a), Frith (1971), Frith & Beehler (1998), Frith & Frith (1997b), Heads (2002), Lambley (1990), Mayr (1931c), Schmid (1993).



PLATE 23

inches 4
cm 10

Genus *PAROTIA* Vieillot, 1816

17. Western Parotia

Parotia sefilata

French: Paradisier sifilet **German**: Strahlenparadiesvogel **Spanish**: Ave-del-paraíso de Pennant
Other common names: Arfak Parotia/Six-wired Parotia/Six-wired Bird-of-paradise, Arfak/Greater Six-plumed Bird-of-paradise

Taxonomy. *Paradisea sefilata* J. R. Forster, 1781, Arfak Mountains, New Guinea.
Hybridization with *Paradigalla carunculata* and *Lophorina superba* recorded. Monotypic.
Distribution. Vogelkop (Tamrau Mts, Arfak Mts) and Wandammen Peninsula (Wondiwoi Mts), in NW New Guinea.



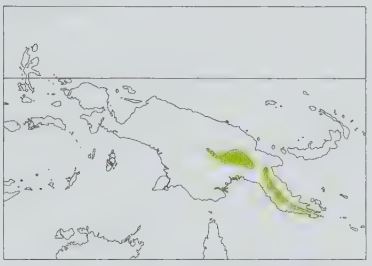
Descriptive notes. Male 33 cm, 175–205 g; female 30 cm, 140–185 g. Large parotia with medium-length tail. Male is entirely velvety jet-black, head adorned with erectile triangular frontal crest of elongate finely pointed silver feathers atop forecrown, rest of crown with dark coppery-bronze sheen, broad nuchal bar of intensely iridescent blue scale-like feathers anteriorly and violet-purple to red-purple feathers with magenta hues posteriorly; from behind each eye, amid ear-tuft of elongate narrowly pointed feathers, three long erectile wire-like bare occipital plumes with near-circular spatulate tips of normal feather webs; upperparts, including upperwing and tail, with dull but rich coppery-bronze sheen; chin and throat velvety blackish with slightest iridescence of coppery bronze to rich purple, grading into otherwise discrete breast shield of large intensely iridescent scale-like feathers; remaining underparts jet-black with plum-purple sheen; iris cobalt-blue with pale yellow outer ring; bill shiny black, mouth greenish-yellow; legs purplish lead-grey. Female is smaller than male (almost no overlap in wing length), lacks head plumes and iridescence, head blackish with slight chestnut lustre, broad pale greyish submoustachial stripe flecked blackish-brown, bold blackish malar stripe (sometimes incomplete at rear), very faint superciliary stripe of tiny pale greyish-buff central feather streaks, upperparts, upperwing and tail olive-brown, paler chin, throat and underparts regularly barred blackish. Juvenile is like female, but with rufous-red outer and inner edgings on flight-feathers and upperwing-coverts; immature male like adult female; subadult male variable, like adult female with few adult male feathers intruding to like adult male but with few feathers of female-like plumage remaining; male tail length decreases slightly with age, shape of outer primaries of immature male almost normal, but in earliest subadult plumage outer two primaries modified (as in adult male). Voice. Harsh "gned gned" or "gnaad gnaad", and other notes like those of a cockatoo (*Cacatua*). Adult male at court gives loud squawking notes, but those in female-like plumage only quiet high-pitched mewing sounds.
Habitat. Middle montane forests and adjacent well-established secondary forest with abundant small saplings; 1100–1900 m.
Food and Feeding. Fruits and arthropods; relative preference for each not known. Probes for arthropods in bark and epiphytes on underside of branches. Joins mixed-species foraging flocks.
Breeding. Few data. Male gonadal activity indicates breeding about Jul–Jan; display season early Aug to late Oct. Polygynous, with presumed promiscuous males seasonally maintaining terrestrial courts, but not known if solitary or in exploded lek; female builds and attends nest alone. Male clears leaves and debris from ground court c. 2 m in diameter, with branches up to c. 3–4 m above it, branches often stripped of leaves by males for display perches; courtship involves static and leg-flexing postures with complex movements of flank plumes, pectoral shield, mantle cape, nuchal crest and occipital plumes; display starts on horizontal perch, male hopping sideways back and forth along perch while repeatedly flicking wings half-open and fanning tail, before hopping to court to perform complex dance involving Upright Sleeked Pose, Initial Display Bow and Ballerina Pose phases, similar to those of *P. lawesii*; female solicits by squatting low on perch, with beak agape, and fluttering wings. No information on nest and nest-site, eggs, incubation and nestling care.
Movements. No information.
Status and Conservation. Not globally threatened. Restricted-range species: present in West Papuan Highlands EBA. CITES II. Few recent data. Common in S Arfak Mts (at Ditschi and Siwi), and even more so in Wandammen Peninsula (Wondiwoi), in late 1940s; common in Arfak Mts mid-Aug 1995. Probably not currently at any risk, but limited distribution dictates need for monitoring.
Bibliography. Bergman (1957c, 1958), Crandall (1932), Diamond (1986a), Frith & Beehler (1998), Frith & Frith (1997b), Gyldenstolpe (1955b), Hartert (1930), Heads (2002), Johnas (1932), Mayr & Meyer de Schauensee (1939), McCarthy (2006), Stresemann (1931).

18. Lawes's Parotia

Parotia lawesii

French: Paradisier de Lawes **Spanish**: Ave-del-paraíso de Lawes
German: Blaunacken-Paradiesvogel
Other common names: Lawes's Six-wired Bird-of-paradise, Lawes's Six-plumed Bird-of-paradise; Eastern/Helena's Parotia (*helenae*)

Taxonomy. *Parotia lawesii* E. P. Ramsay, 1885, Astrolabe Mountains, subsequently considered to be Aruma Apa-Maguli Range, Owen Stanley Range, New Guinea.
Intergeneric hybridization with *Paradisaea rudolphi* recorded; no records of hybridization with sympatric *P. carolae*. Race *helenae* sometimes treated as a separate species. Additional proposed races *exhibita* (described from Mt Hagen area) and *fuscior* (Herzog Mts) synonymized with nominate. Two subspecies recognized.
Subspecies and Distribution.
P. l. lawesii E. P. Ramsay, 1885 – highlands of EC New Guinea E to S slopes of SE peninsula.
P. l. helenae De Vis, 1897 – N watershed of peninsular SE New Guinea (from Waria SE to Milne Bay), possibly also S watershed in extreme SE.



Descriptive notes. Male 27 cm, 153–195 g; female 25 cm, 122–169 g. Broad-winged and short-tailed parotia. Male nominate race is velvety jet-black, head adorned with erectile silver narial tuft atop basal half of upper mandible, immediately behind this a frontal crest of coppery-brown feathers, and with narrow nuchal bar of intensely iridescent blue to pink-purple scale-like feathers; behind each eye, from amid ear-tuft of elongate pointed feathers, three long erectile wire-like black occipital plumes with roughly circular spatulate tips; mantle and back with silk-like sheen that appears coppery bronze and/or green in some lights, remaining upperparts, including tail, velvety jet-black with coppery-bronze sheen; primaries paler, more brownish-black, but exposed leading edges dully iridescent green in some lights; velvety jet-black chin and throat with iridescent sheen of purple, this grading into otherwise discrete breast shield of large intensely iridescent scale-like feathers bronzed metallic emerald-green to greenish-yellow and, in some lights, purple-magenta to bluish-violet (jet-black feather bases visible at lower side of shield), remaining underparts jet-black with coppery sheen; iris cobalt-blue with narrow pale cream-yellow outer ring (but bird can alter colour, from mostly blue to mostly yellow); bill shiny black, mouth lime-yellow to lime-green; legs purplish lead-grey. Female is smaller than male, lacking head plumes and iridescence, has distinctive brownish-black head with contrasting paler submoustachial stripe, dark malar stripe, upperparts mostly chestnut-brown, underparts regularly barred blackish, bill brownish-black. Juvenile undescribed; immature male like adult female but iris duller, more greyish to brownish; subadult male variable, like adult female with few adult male feathers intruding to like adult male but with few female-like feathers remaining, adult head plumage acquired first, when wings and tail similar to those of adult, and breast shield has coppery sheen, rather than clearer green of fully plumaged male; male tail length decreases slightly in length with age. Race *helenae* differs from nominate in having narial tuft of adult male bronzed brown, not silvery white, and female dorsal plumage slightly less russet. Voice. Possible advertisement a loud, raucous, growling, metallic and rasping or grating "graannh-graannh" or unpleasant "kraanh kraanh", sounding anguished and often questioning, the note given up to six times. A call heard on Mt Missim was "whennh", like that of *Cicinnurus magnificus*. Race *helenae* in Mambare valley (above Kanga, at 1000 m) heard to give double harsh "kschack kschack". Males give nasal twittering at courts; prior to display a faint short "sip".
Habitat. Middle montane forest, including primary mixed oak forest, disturbed forest, also secondary growth and large to small remnant forest patches within areas of extensive village gardens; 500–2300 m, mostly 1200–1900 m.
Food and Feeding. Mostly fruits; also some animals, i.e. arthropods and skinks (Scincidae). Leaves eaten in captivity. Takes animal prey from epiphytes, dry tree limbs and foliage 20–30 m above ground. One individual in female-like plumage foraged for arthropods in a mixed-species flock of which *Paradisaea raggiana* also a member.
Breeding. Season at least Jun–Jan; egg-laying early Dec (one nest), a nest with chick 5–6 days old in late Nov, males with gonads moderately enlarged Jan–Jul and much enlarged Aug–Dec, females with moderately enlarged oocytes Aug–Dec. Polygynous, with promiscuous males seasonally maintaining terrestrial courts dispersed as exploded leks, female builds and attends nest alone. Courts of 25 males were 5–350 m (average 77 m) apart, males of closer ones (15 m) being in visual and/or auditory (20–70 m) contact, each court maintained by single adult (infrequently, a male may have two immediately adjacent courts), male advertisement-sings from court perches or canopy above, court size variable, 0·5–20 m²; male cleans court of leaves and debris and decorates it with sloughed snakeskin, mammal dung, chalk, fur, feathers and bone (may steal decorations from neighbouring courts), decorations not used in display but removed by females throughout nesting season; some females show fidelity to particular male, returning to same individual to mate year after year; neighbouring males disrupt each other's courtship; courtship involves static and leg-flexing postures with complex movements of flank plumes, pectoral shield, mantle cape, nuchal crest and occipital plumes; male performs Bounce Display on court perch as female approaches (analogous to Hopping-on-the-spot Display of *P. carolae*); ground display a complex dance involving Upright Sleeked Pose, Initial Display Bow, Ballerina Pose, and Back–forward Dance phases, male typically lunges across court to a female prior to copulation; complete sequence consists of danced ritualized steps and body movements accompanied by intricate feather manipulations. Nest like that of *Manucodia*, one described as an open shallow structure of fern tendrils and creeping-fern stems worked together with a few green fern fronds on outside, lined with fine tendrils, another was large and bulky but shallow; placed c. 5–12 m above ground in canopy foliage or vine tangle. Clutch 1 egg; no information on incubation and nestling periods. An adult-plumaged male recaptured at point of original capture more than 8 years later, and thus more than 15 years old.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. CITES II. Common in Tari Valley and fairly common in Owen Stanley Mts. On Mt Missim, 28 courts of 25 males were in area of c. 4 km² and three other males called regularly but apparently lacked a court. Although this species inhabits forest at elevations settled by humans, it appears not to be under any current threat.
Bibliography. Anon. (1989), Beehler (1983b, 1989a), Beehler & Pruett-Jones (1983), Coates (1990), Coates *et al.* (1970), Crandall (1931), Diamond (1972), Frith, C.B. & Beehler (1998), Frith, C.B. & Frith (1981, 1996a, 1997b), Harrison & Frith (1970), Mack & Wright (1996), Majnep & Bulmer (1977), Mayr & Rand (1937), McCarthy (2006), Pratt & Stiles (1985), Pruett-Jones (1985), Pruett-Jones & Pruett-Jones (1988b, 1990), Salvadori (1896), Schodde & McKean (1972, 1973b), Scholes (2008b, 2008c).

19. Wahnes's Parotia

Parotia wahnesi

French: Paradisier de Wahnes **Spanish**: Ave-del-paraíso de Wahnes
German: Wahnesparadiesvogel
Other common names: Wahnes's Six-wired Bird-of-paradise/Parotia, Wahnes's Six-plumed Bird-of-paradise, Huon Parotia

Taxonomy. *Parotia wahnesi* Rothschild, 1906, Rawlinson Mountains, New Guinea.
Monotypic.

On following pages: 20. Carola's Parotia (*Parotia carolae*); 21. Foja Parotia (*Parotia berlepschi*); 22. King of Saxony Bird-of-paradise (*Pteridophora alberti*).

Distribution. Adelbert Range and Huon Peninsula (Finisterre Range, Saruwaged Range, Cromwell Mts, Rawlinson Mts), in NE New Guinea.



Descriptive notes. Male 43 cm, 170–172 g; female 36 cm, 144–154 g. Large parotia with long, wedge-shaped tail often cocked slightly upward or to the side. Male is entirely velvety jet-black, head decorated with distinctively large erectile narial tuft of elongate coppery bronzed feathers and narrow nuchal bar of intensely iridescent blue to pink-purple scale-like feathers; behind each eye, from amid ear-tuft of elongate narrowly pointed feathers, three long erectile wire-like bare occipital plume shafts with spatulate tips of normal black feather web; mantle to uppertail with slight plum-purple sheen; velvety black chin and throat with slight purple iridescence, this grading into otherwise discrete breast shield of large scale-like feathers intensely iridescent bronzed emerald-green to green-yellow and, in some lights, purple, magenta to bluish-violet (jet-black feather bases visible on lower side of shield), remaining underparts jet-black with plum-purple sheen; iris cobalt-blue, comparatively broad pale greenish-cream outer ring; bill shiny black; legs purplish lead-grey. Female is smaller than male (no overlap in wing length), lacking head plumes and iridescence; cryptically coloured brown above, with brownish-blackish head, off-white superciliary stripe originating from behind eye, and broad submoustachial stripe flecked blackish-grey, bordered below by comparatively narrow blackish malar stripe, chin and throat whitish-grey, flecked and barred brownish-black, grading to remaining underparts of brown-cinnamon, uniformly barred brownish-black. Juvenile undescribed; immature male like adult female, but iris as adult male; first-year plumage has pointed rectrices and lacks indentation on ninth primary (present on adult); male tail length slightly decreases with age. VOICE. Male calls at court include harsh raspy "yeah-yeah" or "yack-yack", or a "khh kaakkk" with quality like that of a cockatoo (*Cacatua*), possibly as advertisement. Similar harsh screeching transcribed as sharp and dry "wetch" or "snatch" given in twos or as part of longer, more complex song based on them; also nasal twittering, and single loud nasal "garr" note. Scream of adult male described as essentially like that of *P. lawesii*, but slightly higher-pitched, quieter and given more often. Thin and soft cheeping notes and rolling trill-like calls given by male descending to court from perches above. Whistling wing noise produced as birds fly about their court, and ticking sound produced as wings flicked during perched display.

Habitat. Middle montane forests; 1300–1600 m in Adelbert Range and 1100–1700 m in Huon Peninsula. Display courts tend to be adjacent to or within windfall gaps, and thus beneath a hole in canopy; two were c. 5 m apart in thick shrubbery beneath small canopy gap on broadly rounded ridge at 1590 m in mixed primary montane forest.

Food and Feeding. Little known. Fruits and insects recorded as eaten, but relative preferences not known; leaf-eating recorded in captivity. Forages actively in subcanopy. Seeks insects by probing in moss and epiphytes.

Breeding. Season at least Nov–Feb, but data few; display period centred on dry season, waning court attendance noted in Jan. Polygynous, promiscuous males seasonally maintaining terrestrial display court on flat parts of gently sloping hillside or flat ridgetop, courts solitary but within auditory range of others, thus possibly as exploded lek; female builds and attends nest alone. Male cleans court of leaves and debris beneath at least one horizontal perch, leaves removed from saplings within court; courtship involves static and leg-flexing postures, with complex movements of flank plumes, pectoral shield, mantle cape, nuchal crest and occipital plumes; basic display pattern similar to that of *P. lawesii* but with some variation, display differs mainly in that it is preceded by little court-clearing, narial tufts opened but no crest to extend forwards to cover them, occipital plumes are thrown forwards before bird stands erect, and it uses tail and wings when crouched; male performs a Horizontal Perch Pivot as enticement followed by Horizontal Perch Sidle and Ballerina Dance; as with congeners, courtship highly complex, involving eleven diagnosable behaviour patterns, including some of up to 46 elements, within highly structured framework. In captivity, clutch 2 eggs, laid on consecutive days. No other information.

Movements. Presumed resident

Status and Conservation. VULNERABLE. Restricted-range species: present in Adelbert and Huon Ranges EBA. CITES II. Very poorly known. Uncommon to rare in Adelbert Range; locally common in Cromwell Mts. Estimated global population in range c. 2500–10,000 individuals. Declining as a result of increasing human population, leading to habitat loss. Most recent records from Satop (Cromwell Mts), where three individuals observed during three days in 1994; much scarcer than *Astrapia rothschildi* (16 seen in same three-day period). Although human population in region relatively small, it is expanding rapidly, resulting in increasing clearance of forest within this species' elevational range, which is the same as that preferred by local people for settlement and agriculture. Comprehesive survey required.

Bibliography. Anon. (2008j), Butchart & Stattersfield (2004), Coates (1990), Crandall (1940), Frith & Beehler (1998), Frith & Frith (1979, 1997b), Gilliard (1969), Heads (2002), Mackay, M.D. (1990), Mayr (1931c), Schodde & Mason (1974), Scholes (2008a), Stattersfield & Capper (2000), Stresemann (1924).

20. Carola's Parotia

Parotia carolae

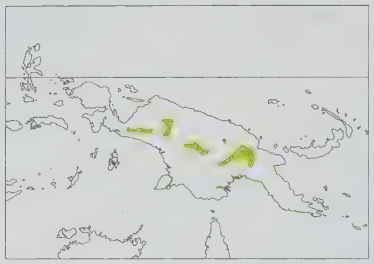
French: Paradisier de Carola **German**: Carolaparadiesvogel **Spanish**: Ave-del-paraíso de Carola
Other common names: Queen Carola's Six-wired Bird-of-paradise, Queen Carola's Parotia

Taxonomy. *Parotia carolae* A. B. Meyer, 1894, "Amberno River" [Mamberamo River]; error = Weyland Mountains, New Guinea.

Forms a superspecies with *P. berlepschi*, previously treated as conspecific. Intergeneric hybridization with *Lophorina superba* recorded; females of the two exhibit parallel geographical variation, one explanation being that smaller *L. superba* mimics larger and more aggressive present species. Five subspecies recognized.

Subspecies and Distribution.

P. c. carolae A. B. Meyer, 1894 – Weyland Mts E to Wissel Lakes (Paniai) region, in W New Guinea.
P. c. meeki Rothschild, 1910 – Snow Mts, from E of Wissel Lakes and S of Doorman Mts (N scarp facing Mamberamo R), E to C New Guinea (around W edge of Victor Emanuel Range).
P. c. chalcothorax Stresemann, 1934 – Doorman Mts, just S of Idenburg R (Taritatu R), in W New Guinea.
P. c. chrysenia Stresemann, 1934 – N scarp of C Cordillera, including Lordberg, Hunstein Mts and probably Schrader Range, also N scarp of Bismarck Range, in E New Guinea.
P. c. clelandiae Gilliard, 1961 – from C New Guinea SE probably to S watershed of Eastern Highlands (E at least to Crater Mt).



Descriptive notes. Male 26 cm, 205 g (one *clelandiae*); female 25 cm, 110–163 g. Distinctive short-tailed parotia. Male nominate race has velvety jet-black head with coppery-bronze sheen, short erectile blackish-bronzed frontal crest tipped silver-white, jet-black elongate and vertically raised loral and foreface feathering from nostril to above eye; eye broadly encircled by iridescent coppery-gold feathering; feathering on slightly concave crown similar to that around eye, and immediately behind this a narrow nuchal bar of highly iridescent scale-like feathers that appear blue-green to purple and/or magenta; behind each eye, from amid ear-tuft of elongate narrowly pointed feathers, three long erectile wire-like occipital plumes with relatively small spatulate tips; mantle to uppertail velvety jet-black with coppery-bronze sheen, including upperwing the same except for primaries and coverts, which brownish-black; chin dusky olive-brown, smudged blackish, with paler tips of elongate "whiskers" surrounded by malar area and throat of buff with golden sheen; lower central throat more whitish, flecked cinnamon, with fine long whiskers on each side, grading into otherwise discrete breast shield of large scale-like feathers with intense iridescence of bronzed yellow-green and/or magenta to pink (jet-black feather bases visible on lower side of shield); remaining central underparts, to undertail-coverts, blackish-brown with iridescent lustrous coppery sheen, becoming browner to dark reddish-brown adjacent to extensive patch of cotton-white elongate and inwardly curving flank plumes; iris sulphur-yellow; bill black, mouth colour apparently pale green; legs blackish-grey. Female is smaller than male (notably in wing length) but with tail longer; lacks head plumes and iridescence; plumage very different, brownish to grey-brown head with broad supercilium, moustachial and submoustachial stripes dirty white, flecked olive-brown, some paler flecks extending onto anterior ear-coverts, malar area olive-brown, upperparts and tail brown, upperwing with ochraceous chestnut area on exposed parts of flight-feathers and outer greater coverts, chin faintly barred greyish-brown, throat paler, underparts buff with blackish-brown barring; iris pale grey or cream to yellow (difference possibly age-related), but confirmation required. Juvenile undescribed; immature male like adult female, but iris pale grey; subadult male variable, like adult female but with few feathers of adult male plumage intruding, initially on head, to like adult male with few feathers of female-like plumage remaining; male tail length decreases considerably with age. Race *meeki* is like nominate in size and appearance, but bill slightly larger, and chin and side of throat blackish; *chalcothorax* is like nominate, but occipital plumes significantly longer, upperparts with bright coppery sheen, underparts more coppery, and long loral feathering more brownish (less intensely black); *clelandiae* is like nominate, but upperparts darker, more jet-black (less brown), and on average larger, bill slightly shorter, and with longer occipital plumes (almost no overlap in length with nominate); *chrysenia* has tail longer than all other races, occipital plumes longer than all except *chalcothorax*, said to differ from nominate in having long black loral feathering with coppery sheen (like eyering but darker), but several specimens lack this (their lores being pure black). Females vary subtly with race, notably in extent of pale facial stripes and in overall colour saturation; further study required. VOICE. Loud advertisement song "scree scree scree, oo-wit, oo-wi-oo", first 3 notes short and grating, last two phrases powerfully whistled and low-pitched, first of which (of 2 notes) rising and second (3 notes) a repetition of the first and reminiscent of human wolf-whistle; also characteristic of male is upward-inflected "kwoi", given singly or up to four times (typically two times); also grating "chack", bell-like squeaking call, and loud, grating "cor cor cor". Variety of other notes, including short chips, squeaks and chortles, a bleating whistle, a metallic note suggestive of *P. lawesii*, and some quiet musical notes. Duetting by males common; calls of other bird species and of micro-hylid frogs possibly mimicked. Adult male produces clacking sound with wings.

Habitat. Primary and secondary middle montane forests, also regrowth and abandoned gardens; 1100–2000 m, mainly 1450–1800 m.

Food and Feeding. Fruits and animals, but relative preferences unknown; leaf-eating recorded in captivity. Forages mainly in upper and middle storeys of forest; groups of adult males and individuals in female-like plumage recorded in fruiting trees and elsewhere. Seeks insects by probing.

Breeding. Few data; female gonadal activity indicates breeding in at least Sept–Oct; display season in E New Guinea Jun, Jul and Oct (dry season) in Jimi R area and Oct–Dec in Herowana area. Polygynous, promiscuous males seasonally maintaining terrestrial courts, dispersed to form exploded leks; female builds and attends nest alone. Courtship involves static and leg-flexing postures, with complex movements of flank plumes, pectoral shield, mantle cape, nuchal crest and occipital plumes, both on court perches and on court floor (recent detailed field research revealed courtship of this species to be as complex as that of any other avian species, involving 58 distinct elements); male performs a Hopping-on-the-spot-like display on a court perch as female approaches (analogous to Bounce Display of *P. lawesii* and *P. wahnesi*), as well as alternate "sideways-facing" displays; basic pattern on ground initially like that of *P. lawesii* up to Initial Display Bow; courtship elements include Ballerina Display, and some feature the white area of flank plumes and fine detail of elaborate head plumage not found in other adult male pariotias. No information on nest, nest-site, eggs, incubation and nestling periods, and other aspects of breeding.

Movements. Presumed resident.

Status and Conservation. Not globally threatened. CITES II. Fairly common and widepsread; reasonably common on S slopes of Bismarck Range. Adult males thought to be outnumbered by female-plumaged birds (by ratio of 1:3) in Ok Tedi area of C New Guinea. No evidence of any current threat, nor of any likelihood that this species will become at risk in immediate future.

Bibliography. Clover (2006), Coates (1990), Diamond (1985), Forshaw & Cooper (1977), Frith, C. B. (1968), Frith, C.B. & Beehler (1998), Frith, C.B. & Coles (1976), Frith, C.B. & Frith (1996b, 1997b), Gilliard & LeCroy (1961), Gyldenstolpe (1955a), Healey (1976, 1980), Junge (1953), Mayr (1962d), McCarthy (2006), Mees (1964a), Rothschild (1931), Scholes (2006, 2008b).

21. Foja Parotia

Parotia berlepschi

French: Paradisier de Berlepsch **Spanish**: Ave-del-paraíso de Berlepsch
German: Berlepschparadiesvogel
Other common names: Berlepsch's Six-wired Bird-of-paradise, Berlepsch's/Kleinschmidt's Parotia

Taxonomy. *Parotia berlepschi* O. Kleinschmidt, 1897, New Guinea.

Forms a superspecies with *P. carolae*, and previously treated as conspecific. Monotypic.

Distribution. Foja Mts, in W New Guinea.

Descriptive notes. c. 25 cm. Male has blackish head and body, with nape, upper neck and mantle heavily bronzed; short erectile frontal crest tipped silver-white, elongate and vertically raised loral



and foreface feathering from nostril to above eye tipped whitish at rear (above eye), eye narrowly encircled by dark iridescent golden-brown feathering; crown with dark golden yellowish-brown iridescence, and similar but darker sheen on ear-coverts, nape and hindneck; behind each eye, from amid ear-tuft of elongate narrowly pointed feathers, three long erectile wire-like occipital plumes (12 cm long) with small spatulate tips; chin, cheek and throat black (slight reddish-brown iridescence in some lights), lower central throat slightly paler, grading into otherwise discrete breast shield of scale-like feathers with iridescence of bronzed yellow-green; rest of central underparts blackish-brown, inwardly curving flank plumes black, brown and white; iris cerulean grey-blue; bill dark grey; legs blackish. Differs from similar *P. carolae* mainly in having slightly shorter bill with upper mandible more decurved, cheeks and chin to throat black, nape and hindneck with golden-brown sheen, elongate loral feathering without whitish terminal tips and less inwardly curled, occipital plumes slightly longer, iris blue (not yellow). Female is smaller than male, lacks occipital plumes and iridescence, has brown upperparts, brownish head and upperparts with broad supercilium, moustachial and submoustachial stripes white, lightly flecked olive-brown, some paler flecks extending onto anterior ear-coverts, malar area olive-brown, chin faintly barred greyish-brown, throat whitish with tiny brown markings, rufous area on exposed parts of flight-feathers and outer greater coverts, and finely dark-barred whitish underparts. Immature male has slightly more extensive whitish on elongate loral feathering, tail longer than adult male. VOICE. Little information. Primary contact song said possibly to be distinct from that of both *P. carolae* and *P. lawesii*; as these exhibit considerable vocal variation, fieldwork and confirmation required.

Habitat. Montane wet forest, at c. 1100–2000 m.

Food and Feeding. No information.

Breeding. No information.

Movements. Presumably resident.

Status and Conservation. Not assessed. CITES II. Until recently was treated as a race of more widespread *P. carolae*. Was for a long time known only from a handful of specimens, and virtually unknown in the field; female observed in Foja Mts in 1985. No further observations until, in Dec 2005, an international team of eleven scientists (from USA, Australia and Indonesia) rediscovered this parotia, among other little-known and new species, in Foja Mts. Habitat within its very small range is currently secure, and area is mostly uninhabited by humans. In view of this species' remote, isolated and highly restricted range within W New Guinea, it would be potentially at risk were any change in status of its presently undisturbed habitat to occur. Extensive further fieldwork and surveys are required.

Bibliography. Beehler (2008), Beehler *et al.* (2007), Kleinschmidt (1897), Rothschild (1908).

Genus *PTERIDOPHORA* A. B. Meyer, 1894

22. **King of Saxony Bird-of-paradise**

Pteridophora alberti

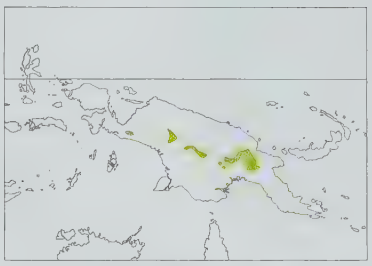
French: Paradisier du Prince Albert **German**: Wimpelträger **Spanish**: Ave-del-paraíso de Alberto
Other common names: Enamelled Bird-of-paradise, The Enamelled Bird

Taxonomy. *Pteridophora alberti* A. B. Meyer, 1894, mountains on Ambernoh River [Mamberamo River] = apparently Weyland Mountains, New Guinea.

Birds from Schraderberg (in Sepik Mts) described as race *buergersi* and birds from S slope of Mt Hagen as *hallstromi*, but both considered inadequately differentiated from those in rest of species' range. Treated as monotypic.

Distribution. C Cordillera of New Guinea from Weyland Mts E, discontinuously (including Snow Mts, Star Mts, Victor Emanuel Range, Mt Bosavi, Mt Hagen, Mt Giluwe, Ambua Range, Kubor Range, Schrader Mts and Bismarck Range), to Kratke Range.

Descriptive notes. Male 22 cm, 80–95 g; female 20 cm, 68–88 g. Male has head, mantle and back velvety black with iridescent sheen of bronzed green, notably on elongated "cape" feathers of mantle; behind each eye, from amid an ear-tuft of elongate feathers, a uniquely modified occipital



plume (up to 50 cm long) of bare central feather shaft with 40–50 plastic-looking "flags" decorating outer side only, the upper surface of each "flag" an enamel-looking glossy sky-blue to true blue and the underside dark brown; rump, uppertail-coverts and uppertail matt black, washed dark brown, upperwing similar but exposed bases and broad leading edges of secondaries and all except outermost two primaries cinnamon; chin and throat as upper head, but large and sparse scale-like feathers at centre and lower border of black throat narrowly tipped iridescent green-blue to purple (suggesting a faint breast shield); remaining underparts dark yolk-yellow, brighter on breast, paler and duller on vent and undertail-coverts, with creamy feathering in flanks; iris dark brown; bill black, mouth pale to rich aqua-green; legs dark brown-grey. Female is smaller than male, lacks occipital plumes, has radically different plumage, most of head and entire upperparts grey to sooty grey, darker and browner on lower back, with chin, throat and neck sides buffy grey with broad dark brownish-grey barring (scalloped appearance), and breast to vent whitish, heavily marked with open, shallow, blackish-brown chevrons, undertail-coverts contrastingly ochraceous. Juvenile undescribed; immature male resembles adult female, but upperparts paler, more uniformly brownish-grey to grey (less scalloped), underparts whiter (less dark barring and spotting), iris red-brown; subadult male variable, like adult female with few feathers of adult male plumage intruding to like adult male with few female-like feathers remaining, first sign of adult plumage is black nasal-tuft feathering and darker primaries with orange (not grey) concealed bases, followed by more black head plumage and some yellow in breast; male tail length decreases slightly with age. VOICE. Adult male gives unique advertisement song, a dry rattling jumble of insect-like notes poured out at rapid pace and suggestive of bad radio static, which briefly turns into a twittering at climax. Adult male courtship vocalizations consist of a subsong of hissing sounds within which soft high-pitched clucks, chatters, mews and squeaks are produced; some vocal avian mimicry may be incorporated. Young male repeats monotonous jeering 4–5 notes, the series rising slightly in pitch, each note harsh, rolling and downslurred, "chweer chweer chweer chweer". Immature male (in female-like plumage) also gives distinctive scolding note and is noisier than adult male.

Habitat. Middle to upper montane forest and forest edge, also lightly disturbed areas of forest around hunting lodges and tracks; 1400–2850 m, mainly 1800–2500 m.

Food and Feeding. Mostly fruits (drupes, notably those of *Timonius belensis*); also insects and spiders (Araneae). Forages mostly alone, at all levels down to shrubbery near ground. Seeks invertebrates by tearing and probing at mosses and lichens.

Breeding. Breeding possible in all months, peak about Jul–Feb; one nest found, constructed in Dec, egg-laying early Jan (Tari Gap, in EC New Guinea); display at least Sept–Apr. Polygynous, solitary promiscuous male advertisement-singing from several traditional emergent perches; female builds and attends nest alone. Male's song perches regularly dispersed, on Mt Hagen apparent territory of adult male in mid-Apr c. 137 m in diameter, male calling from emergent trees 30–37 m tall, but territorality remains to be confirmed; display perches in forest substage (2–15 m high), three groups of 3–7 males reported as displaying at inter-group distances of c. 8–16 km and suggestive of exploded leks (confirmation required, as other observers report solitary males throughout extensive habitat); courtship involves initial canopy advertisement-singing and display from perches in emergent trees, during which male performs simple displays with mouth gaping and movement of occipital plumes, then descends to understorey vine perch to perform Understorey Bouncing Display with leg-flexing (and continuous subsong), wing-shivering and erection of mantle cape, breast shield and head feathering, and occipital plumes raised to c. 45° and held widely apart; copulation follows. Only one nest found, a shallow open cup of loosely accumulated fine stems of epiphytic orchid and fresh green "comb-tooth" fern fronds, egg-cup interior sparsely lined with fine epiphytic orchid stems or tendrils, placed 11 m above ground in large trifurcate upright branch fork of *Timonius belensis* tree; contained 1 egg, incubation period more than 22 days; no information on nestling period.

Movements. Presumably resident.

Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. CITES II. Widespread, and often common. Common at 2745 m and moderately common at 2105–2560 m in Okbap area, in Star Mts; common in Tari Gap; uncommon on Mt Hagen. Three males called from display trees within 1·6 km of each other; c. 1 bird/4·5 ha at Tsuwenkai, in Bismarck Range. Some areas of extensive and apparently suitable habitat appear to lack adult males, while in others a number of males sing from perches dispersed within auditory contact of one another. Appears not likely to be at any risk in the near future.

Bibliography. Beach (1975), Diamond (1972), Frith, C.B. & Beehler (1998), Frith, C.B. & Frith (1990b, 1990c, 1992a, 1993a, 1997b, 1997c), Gilliard (1969), Gilliard & LeCroy (1968), Gyldenstolpe (1955a), Hartert *et al.* (1936), Healey (1975), Kwapena (1985), Majnep & Bulmer (1977), Rothschild (1921, 1931), Schodde (1976).



PLATE 24

inches 4

cm 10

Genus *PTILORIS* Swainson, 1825

23. Magnificent Riflebird

Ptiloris magnificus

French: Paradisier gorge-d'acier **Spanish**: Ave-del-paraíso Goliazul
German: Prachtparadiesvogel
Other common names: Albert Rifle-Bird, Prince Albert's Riflebird; Growling/Eastern Riflebird (*intercedens*)

Taxonomy. *Falcinellus magnificus* Vieillot, 1819, Dorey, Vogelkop, New Guinea.
Sometimes thought to form a superspecies with *P. victoriae*, and has been considered conspecific. Intergeneric hybridization with *Lophorina superba*, *Seleucidis melanoleucus* and *Paradisaea minor* recorded. Race *intercedens* sometimes treated as separate species. Three subspecies currently recognized.
Subspecies and Distribution.
P. m. magnificus (Vieillot, 1819) – W & C New Guinea from Vogelkop E to Wewak area in N and, in S, to Purari R.
P. m. intercedens Sharpe, 1882 – E New Guinea SE from about Wanuma (Adelbert Mts).
P. m. alberti Elliot, 1871 – Albany I and patchily on adjacent Cape York Peninsula (S to Weipa area on W coast and to Rocky R area of McIlwraith Range on E), in NE Australia.



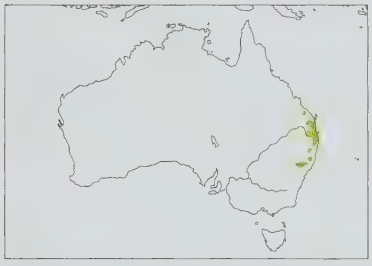
Descriptive notes. Male 34 cm, 143–230 g; female 28 cm, 94–185 g. Fairly large paradisaeid with long, decurved bill and short, rather square-ended graduated tail. Male nominate race has velvety jet-black head decorated from lores to nape with scale-like metallic green-blue feathers washed purple and magenta; sides of face, chin and throat dully iridescent violet-purple and/or (rarely) olive-green; mantle to uppertail-coverts, lesser wing-coverts and tertials velvety jet-black with strong iridescence of violet-purple with magenta wash (and, rarely, blues and/or olive-green sheen visible), greater coverts, alula and exposed flight-feathers iridescent dark blue; uppertail velvety jet-black, iridescent deep blue sheen on basal outer edges of webs, but shorter central feather pair highly iridescent metallic dark blue-green to green-blue with violet-purple and/or magenta sheens; narrow area on central throat broadening to upper breast decorated with extensive delta-shaped breast shield of scale-like intensely iridescent green-ish-blue feathers, in some lights washed with violet-purple and/or magenta sheens; lower shield edge bordered by narrow band of velvety jet-black feathers with violet-purple sheen, and below this even narrower band of iridescent bronzed yellow-green; remaining underparts, including elongate filamental flank plumes (extending past tail), matt brownish-black, overwashed with dully iridescent maroon to carmine and/or (rarely) olive-green, particularly against breastband; vent and undertail-coverts, also tips of longer flank plumes, matt blackish; iris dark brown; bill black, gape pale yellow, mouth pale lemon-yellow to lime-green; legs dark leaden grey to blackish. Female is smaller than male, with slightly shorter bill (unlike congeners) and, especially, shorter wing (no overlap between sexes); plumage radically different, cryptically brown and rufous above, with broad supercilium and malar stripe dirty white, finely flecked variably buff to brown, chin whitish to greyish-white, throat flecked and spotted blackish-grey, these marks grading to fine barring on breast and then to broader and paler barring on greyish-white remaining of underparts. Juvenile has plumage soft, more downy, dark bars on breast and belly sooty brown and wider apart, crown and upperparts paler and more rufous; immature male like adult female; subadult variable, like adult female with few feathers of adult male plumage intruding to like adult male with few feathers of female-like plumage remaining; with increasing age male acquires progressively shorter tail, central retrices decreasing in length at greater rate than rest. Races differ only minimally, mainly in biometrics: *alberti* is like nominate, but base of culmen slightly less feathered, bill more curved, shorter wing, tarsus and tail, male with only faint maroon sheen below, relatively shorter central pair of rectrices, female browner (less rufous-tinged) above and lacks speckling on upper throat; *intercedens* is like nominate, but bill on average shorter, base of culmen with more feathering, flank plumes shorter (not extending beyond tail). Voice. Races differ in advertisement vocalizations of male: nominate race (W & C New Guinea) and *alberti* (NE Australia) a powerful clear upslurred but variable "woiiieet-woit"; notes of nominate in Kumawa Mts, West Papua, are lower, upward-inflected, clear, hollow ones delivered more as hoots; notes of *intercedens* (SE New Guinea) described variously as "hrraah-hraoou", first syllable rising and last part of second one falling, deep guttural growled "crrraiy-crrrow" or "uráúow-urauow", and above Wasu (in Huon Peninsula) typical double growl-like notes but of harsher, rasping quality and with second note inflected upwards or downwards. Australian *alberti* calls geographically variable: at Cape York 2 identical upward-inflected clear whistled notes, the first sometimes flatter and softer, or the two sometimes repeated as a song series; at Claudie R (Iron Range) first note is lower and briefer and is continuous with second in being fluidly connected by downward inflection prior to sharp end (sounding like a person whistling to attract another); at Rocky R (Silver Plains) call like that at Cape York and nominate race of New Guinea. Louder calls carry up to c. 1 km.
Habitat. Lowland forest, hill forest and middle montane forest, also monsoon forest, swamp-forest, and gallery forest and forest edge; occasionally in mangroves and timber plantations. Sea-level mainly to 700 m, occasionally or locally to 1450 m.
Food and Feeding. Fruits (mostly capsules) and animals, latter including wide variety of insects, spiders (Araneae) and myriapods; overall a greater proportion of arthropods eaten, but relative proportions vary seasonally. Forages mostly in main canopy for fruits, but gleans/probes in lower canopy and subcanopy for animals. Forages alone, occasionally with small groups of loosely associated individuals at fruiting trees; joins (female-plumaged birds possibly more so than adult males) mixed-species foraging flocks containing pitohuis (*Pitohui*) and other paradisaeid species.
Breeding. Season variable across range, at least Jun–Feb, females with enlarged oocytes Feb, Jun, Jul and Oct–Nov and some males with moderately to greatly enlarged gonads during all months (but smallest Feb–Mar); egg-laying early Sept to mid-Feb but also early Jun in SE New Guinea (Moroka area), and nestlings (one nest) Nov and presumed female attending dependent young late Sept in NE Australia; display late wet season to throughout dry season, Apr–Sept near Port Moresby (SE New Guinea). Polygynous, solitary promiscuous male advertisement-singing/displaying from several traditional perches; female builds and attends nest alone. Males regularly dispersed through forest (c. 500 m apart at Ok Tedi, in C New Guinea), but territoriality unconfirmed. Male displays with initially static sleeked postures, then raising fully opened wings high to each side, with head and neck swung between them, followed by vigorously animated hopping along horizontal display bough (unlike *P. victoriae*, not atop a vertical stump) while in this pose; courtship mostly in lower understorey to subcanopy. Nest composed of large dead leaves and vine tendrils loosely put together, sometimes epiphytic ferns fronds included, lined with fine leaf midribs and fibres; recorded sites used in Australia include base of living fronds of pandanus (*Pandanus*) tree crown, atop basket-fern epiphytes on tree trunk, and atop broken-off trunk with new regrowth, variously 0·5–16 m above ground. Clutch 1–2 eggs, mostly 2; no information on incubation and nestling periods.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. CITES II. Mostly common where found; uncommon at 300–1200 m in S Cyclops Mts in Jul, with calling males sparse. In 2002, within Crater Mountain Wildlife Management Area (E New Guinea), estimates at 432–650 m were 14·1 individuals/km² in primary forest, 5·7/km² in old gardens and 5·2/km² in new gardens, and figures at 651–935 m were 14·9 in primary forest, 5·8 in old gardens and none in new gardens. Near Port Moresby (SE New Guinea) 6 birds/10 ha counted; in 100 ha near Kakoro (E New Guinea) minimum of 7 adult males, at mean nearest-neighbour distance of 175 m (range 140–275) m; in Ok Tedi area males called c. 500 m apart; and near Kiunga (C New Guinea) calling adult males were common c. 100–200 m apart, in slightly rolling topography, in both low swampy forest and poorer, more elevated forest. In Australia, one observer considered female-plumaged individuals to number 15 or 20 for every adult-plumaged male. This species is tolerant of selectively logged forest, and thought not likely to be at any risk in near future. In Australia, an adult male killed and eaten by a Rufous Owl (*Ninox rufa*) at Iron Range, in Cape York Peninsula.
Bibliography. Anon. (2003b), Barker & Vestjens (1990), Barnard (1911), Barrett *et al.* (2003), Beehler & Pruett-Jones (1983), Beehler & Swaby (1991), Bell, H.L. (1977, 1982a, 1982b, 1982c, 1984a), Coates (1973b, 1990), Cracraft (1992), Crandall (1938), Crandall & Leister (1937), David & Gosselin (2002b), Diamond (1972), Frith (1997, 1998), Frith & Beehler (1998), Frith & Frith (1993d, 1997b), Gregory (1995), Higgins *et al.* (2006a), Legge *et al.* (2003), MacGillivray (1918), Mack & Wright (1996), Mackay, R.D. (1990), Marsden *et al.* (2006), McCarthy (2006), North (1901), Ogilvie-Grant (1912), Schodde (1976), Schodde & Mason (1999).

24. Paradise Riflebird

Ptiloris paradiseus

French: Paradisier festonné **German**: Schildparadiesvogel **Spanish**: Ave-del-paraíso Festoneada

Taxonomy. *Ptiloris paradiseus* Swainson, 1825, no locality = northern New South Wales, Australia.
Monotypic.
Distribution. E coastal Australia, from SE Queensland (Calliope Range, S of Rockhampton) S on Great Dividing Range, also some lowlands to E, to NE New South Wales (S to just N of Newcastle).



Descriptive notes. Male 30 cm, 134–155 g; female 29 cm, 86–112 g. Fairly large paradisaeid with long, decurved bill and short, barely graduated tail. Male has head (except crown) and upperparts, including upperwing and tail (except central pair of feathers), velvety jet-black with rich silk-like iridescent sheens of purple/magenta, mantle with green sheen; entire crown of scale-like feathers intensely iridescent greenish-blue to bluish-green, washed rich purple, notably on nape; central pair of rectrices short and highly metallic bluish-green to greenish-blue; velvety jet-black chin to lower breast, with central throat to upper breast adorned with extensive, roughly triangular breast shield of scale-like feathers intensely metallic greenish-blue, washed purple, broad feathering below breast shield to undertail-coverts with silk-like iridescent oil-green broken by extensive jet-black feather bases (conspicuously visible at upper and lower border of this area); iris dark brown; bill shiny black, gape pale yellow, mouth bright yellow or lime-yellow; legs black. Female is smaller than male, with shorter wing (almost no overlap between sexes) but larger bill; plumage radically different, cryptically brown and grey-brown above with rufous panel on outer wing, often greyer on head and usually darker on sides of crown and lores, with broad whitish superciliary stripe, whitish submoustachial area, chin and throat, becoming buff on upper breast to pale cinnamon on remaining underparts, which are strongly marked with blackish-brown deep chevrons, deteriorating to barring on flanks and undertail-coverts; legs blue-grey to dark grey. Juvenile undescribed; immature like adult female; subadult male variable, like adult female with few feathers of adult male plumage intruding to like adult male with few feathers of female-like plumage remaining; unlike congeners, male acquires slightly longer tail with increasing age, but central pair of rectrices becomes slightly shorter with age. Voice. Advertisement call of male an explosive "yaassss" (structurally similar to advertisement of *P. victoriae*), repeated once; can be heard from at least 800 m. Immature male calls inferior to those of adult.
Habitat. Subtropical and temperate rainforests; also wet sclerophyll forest adjacent to rainforest and dry sclerophyll forest to 1 km and more from rainforest, particularly during winter. Most numerous above 500 m, rarely below 200 m except in winter, when down to sea-level.
Food and Feeding. Fruits and animals, latter including wide variety of insects and spiders (Araneae); arthropods probably dominate diet, but relative proportions vary seasonally. Forages mostly high up in forest. Usually alone, but aggregations of up to six or seven individuals visit fruiting trees, sometimes with bowerbirds (Ptilonorhynchidae).
Breeding. Season Aug–Feb, peak in Sept–Jan, a presumed female with fledgling(s) mid-Feb and another mid-Mar; display at least Aug–Dec, period of least calling Mar–Aug, with significant increase in Sept and most vocal Oct–Feb. Polygynous, solitary promiscuous male advertisement-singing/displaying from several traditional arboreal perches; female builds and attends nest alone. Display sites of males regularly dispersed in forest; each site contains several regularly used exposed bare canopy or subcanopy limbs or branches, and male probably territorial at least with

On following pages: 25. Victoria's Riflebird (*Ptiloris victoriae*); 26. Superb Bird-of-paradise (*Lophorina superba*).

regard to these. Detailed understanding of sequence of display to mating lacking, but courtship involves a static posture, dance, leg sway, movements of wings and pectoral shield, and mouth gaping; much as for *P. victoriae*, but perhaps with wings held more horizontal and less vertical. Nest larger and bulkier than that of *P. victoriae*, a shallow bowl of vine stems, lined with finer vines, fibres and rootlets, rim typically decorated with fresh green fronds of climbing ferns (*Polypodium*), sometimes also lengths of sloughed snakeskin, some large dead leaves incorporated into base; frequently built in dense tangle of vines (including *Calamus*) 5–40 m above ground, also in many other sites; same nest tree reused habitually. Clutch 1–2 eggs, mostly 2; incubation period not documented, possibly 18–19 days; nestling period at one nest at least 21 days.

Movements. Presumably resident. Some short-distance movement; during austral winter, some move from subtropical and temperate rainforests and adjacent wet sclerophyll forest into dry sclerophyll forest up to 1 km and more from rainforest. Some descend to lower elevations, down to sea-level, in winter months.

Status and Conservation. Not globally threatened. Restricted-range species: present in Eastern Australia EBA. CITES II. Common in upland forests in N of range; less abundant in remaining habitat in S. Has lost much habitat through forest clearance, with consequent diminution of range. Rare or absent in rainforest patches of 2·5 ha or smaller in NE New South Wales, but reportedly extinct in remnants as large as 60 ha in Big Scrub. Six individuals recorded in 112 ha of subtropical rainforest and 13 in 102 ha of wet sclerophyll forest near Dorrigo (New South Wales). Because of lowland clearance, now predominantly in hill forests of Great Dividing Range.

Bibliography. Barker & Vestjens (1990), Barrett *et al.* (2003), Beehler & Pruett-Jones (1983), Campbell (1901), Church (1997), David & Gosselin (2002b), Frith (1997), Frith & Beehler (1998), Frith & Cooper (1996), Frith & Frith (1997b), Higgins *et al.* (2006a), Holmes (1973), Jackson (1907), McAllan & Bruce (1988), Norris (1964), North (1901), Ramsay (1919), Schodde & Mason (1999), Slater (1995).

25. Victoria's Riflebird

Ptiloris victoriae

French: Paradisier de Victoria **Spanish**: Ave-del-paraíso de Victoria
German: Victoriaparadiesvogel
Other common names: Queen Victoria('s) Riflebird, Victorian/Lesser Riflebird

Taxonomy. *Ptiloris Victoriae* Gould, 1850, Barnard Island, north Queensland, Australia.
Sometimes thought to form a superspecies with *P. magnificus*, and has been considered conspecific. Monotypic.

Distribution. Atherton Region of NE Queensland (from Big Tableland, S of Cooktown, S to Mt Elliot, and some offshore islands), in NE Australia.



Descriptive notes. Male 25 cm, 91–119 g; female 23 cm, 77–96 g. Fairly large paradisaeid with fairly long, decurved bill and short tail. Male is mostly velvety jet-black with rich silk-like purple/magenta sheens above, crown feathers scale-like and intensely iridescent greenish-blue to blue-green, washed rich purple, especially on nape, mantle with green sheen, central pair of rectrices short and metallic bluish-green to greenish-blue; velvety jet-black chin to lower breast, central throat to uppermost breast with roughly triangular breast shield of intensely metallic purple-washed greenish-blue scale-like feathers, belly to undertail-coverts olive-grey to oily olive-green, typically with more bronze-yellow reflections than in *P. paradiseus*, and some black feather bases visible posteriorly; iris dark brown; bill shiny black, gape pale yellow, mouth bright yellow or lime-yellow; legs black. Differs from similar *P. paradiseus* mainly in smaller size, narrower and smaller breast shield, and often more bronze-yellow lower underparts, with lack of visible black feather bases on anterior part of abdomen. Female is smaller than male, with shorter wing (almost no overlap between sexes) but larger bill; plumage very different, grey to grey-brown above, with rufous panel on outer wing, broad whitish superciliary stripe, whitish submoustachial area and chin, becoming buff on throat and upper breast, and rich cinnamon on remaining underparts, with small blackish chevron marks (except on lowermost areas), becoming more bar-like on sides, undertail-coverts paler; legs blue-grey to dark grey. Juvenile is like female, but underparts indistinctly barred, not spotted, brownish, bill pale bluish-grey, smudged dark grey, legs pale bluish-grey; immature male like female, gaining increasingly stronger and broader blackish flank barring until first sign of adult male plumage attained; subadult male variable, like adult female with few feathers of adult male plumage intruding to like adult male with few feathers of female-like plumage remaining; central rectrices decrease slightly in length with age. VOICE. Male advertisement call an explosive loud "ssssssshh" or "yaaaass", in S of range typically immediately repeated, but in N (on Atherton Tableland) usually a single note; often responds immediately to advertisement of other males. Aggressive call to conspecifics a sharp repeated "kek". A parent gave repeated soft low "kuk" on nest rim, followed by a "bubbling" form of such notes when flying from nest and from nearby perches.

Habitat. Lowland to hill rainforests, also adjacent wet sclerophyll woodland dominated by eucalypts (*Eucalyptus*) and swamp-woodland dominated by paperbarks (*Melaleuca*); also landward edge of mangrove communities and gardens. Sea-level to 1200 m.

Food and Feeding. Fruits (mostly capsules); insects, including cockroaches (Blattodea) and cicadas (Cicadidae), and spiders (Araneae), centipedes (Chilopoda) and millipedes (Diplopoda); also flower nectar. Probably more arthropods than fruits overall, but relative proportions vary seasonally. Nestlings fed with animal items (up to 80–90%) and fruits. Forages mostly in canopy, also close to and on forest floor. Takes arthropods by gleaning and probing. Up to four or more individuals may gather at a single fruit resource during about May–Jul (outside display season).

Breeding. Season at least Aug–Feb; egg-laying late Aug to early Jan, and female with fledged young observed late Nov and Jan–Mar; males with moderately to greatly enlarged gonads Jan, Apr, Jul and Sept–Oct and females Oct–Dec; display season Jul–Dec, post-moult displays (particularly by young males) during Mar–Apr. Polygynous, solitary promiscuous male advertisement-singing/displaying from traditional arboreal perch; female builds and attends nest alone. Adult male sedentary and territorial with regard to traditional display site during breeding season, display perches consisting of top of broken-off vertical tree or tree-fern stump several metres to many metres tall (higher and larger, bare, living or dead tree boughs occasionally used); courtship displays involve a static posture, dance, leg sway, wing-clap, wing movements and movements of pectoral shield, and mouth gaping; display elements include a Circular Wings and Gape and an Alternate Wings Clap; females attracted by advertisement calls which are accompanied by conspicuous wide gaping to expose bright yellow mouth. Nest has outer structure of *Pyrrosia* ferns (some with associated mossy growth), within this a substantial cup-shaped structure of dead leaves, with shallow egg-cup lining of fine woody tapering stems of vine flower inflorescences, many nests with sloughed snakeskin on outer rim; built 1·5–20 m above ground, often atop broken-off tree trunk with prolific new foliage, in vine-covered tree or in centre of tree-fern crown, sometimes in pandanus (*Pandanus*), fan palm (*Licuala*) or cordyline (*Cordyline*); nest-site habitually reused. Clutch 1–3 eggs, mostly 2; incubation period 18–19 days; female ceases brooding of chicks when latter 8 days old, feeding rates higher for brood of two than for one, nestling period 13–15 days; one fledgling was fed 74 days after leaving nest. A wild male lived for more than 15 years.

Movements. Mostly sedentary; during winter months some adult males move out of rainforest into adjacent wet sclerophyll woodland, typically frequenting ecotone to W of Great Dividing Range rainforests.

Status and Conservation. Not globally threatened. Restricted-range species: present in Queensland Wet Tropics EBA. CITES II. Common throughout small range; reported as more abundant on Bloomfield R during Jul–Jan than at other times, but this may reflect relative vocalization levels and hence conspicuousness. Adult males estimated to occupy area of c. 2 ha or more. Range has contracted owing to habitat loss; for example, much rainforest on Atherton Tableland has been destroyed. Can be a pest in soft-fruit orchards and is sometimes persecuted as a result. Despite this, the species appears not to be facing any significant threat.

Bibliography. Barker & Vestjens (1990), Barrett *et al.* (2003), Brooker & Brooker (1989), Bruce & McAllan (1990), Chapman *et al.* (1999), Frith, C.B. (1997), Frith, C.B. & Beehler (1998), Frith, C.B. & Cooper (1996), Frith, C.B. & Frith (1995c, 1997b, 1998c), Frith, D.W. (1984), Grant & Litchfield (2003), Higgins *et al.* (2006a), Iredale (1950), Jackson (1909), North (1901), Schodde & Mason (1999).

Genus *LOPHORINA* Vieillot, 1816

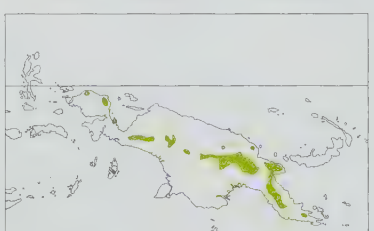
26. Superb Bird-of-paradise

Lophorina superba

French: Paradisier superbe **German**: Kragenparadiesvogel **Spanish**: Ave-del-paraíso Soberbia
Other common names: Lesser Superb Bird-of-paradise

Taxonomy. *Paradisea Superba* J. R. Forster, 1781, Arfak Mountains, New Guinea.
Intergeneric hybridization with *Paradigalla carunculata*, *Parotia sefilata*, *Parotia carolae*, *Ptiloris magnificus*, *Epimachus fastosus* and *Cicinnurus magnificus* recorded. Proposed race *connectens* (Dawong, in Herzog Mts), treated as synonym of *latipennis*. Proposed race *sphinx*, described on basis of one immature male (like *minor* but considerably larger, with more reddish-brown on upperparts, eyestripe less extensive, forehead and neck lacking white flecks), is of unknown origin, but possibly from mountains of far SE New Guinea; validity unproven. Form named as "*pseudoparotia*" (based on single specimen from Hunstein Mts, in middle Sepik Mts) has been shown to be hybrid of present species and *Parotia carolae*. Five subspecies currently recognized.

Subspecies and Distribution.
L. s. superba (J. R. Forster, 1781) – Vogelkop (Tamrau Mts and Arfak Mts), in NW New Guinea.
L. s. niedda Mayr, 1930 – Mt Wondiwoi (in Wandammen Peninsula), in NW New Guinea.
L. s. feminina Ogilvie-Grant, 1915 – C Cordillera from Weyland Mts E to C New Guinea (Hindenburg Mts and Victor Emanuel Mts).
L. s. latipennis Rothschild, 1907 – E & NE New Guinea in Central Highlands and Eastern Highlands (E to Herzog Mts, Kuper Range and Ekuti Range), also Adelbert Mts and mountains of Huon Peninsula.
L. s. minor E. P. Ramsay, 1885 – mountains of SE New Guinea (E probably from SE of Wau).



Descriptive notes. Male 26 cm, 60–105 g; female 25 cm, 54–85 g. Male nominate race has scale-like crown feathers iridescent metallic green-blue with purple to magenta sheens, rest of head velvety jet-black with dark coppery-green sheen, tuft of elongate erectile feathers above and behind each nostril, feathers at base of latter, those on lores and elongate forward-pointing chin feathers with purple to magenta iridescence; nape feathers grossly elongated and modified to form vast erectile nuchal "cape", its outer spatulate to fan-shaped feathers resulting in a symmetrical shape when raised, these velvety jet-black feathers and those of mantle with dull dark olive-green iridescence; back and rump black, uppertail-coverts as mantle; upperwing-coverts and tertials velvety matt black, flight-feathers blackish-brown, primaries with narrow olive-brown leading edges; uppertail similar to remiges but velvety jet-black, longest central pair of feathers with violet-purple iridescence; throat velvety black with dark olive-green sheen grading to purple iridescence, all with magenta washes, feathers scale-like and greatly elongated laterally, forming shallow, "winged" delta-shaped shield of intensely iridescent metallic greenish-blue with bluish-green to violet-purple sheens; underparts slightly glossy black, with trace of dark olive-green and purple sheens on belly; iris dark brown; bill black, mouth lemon-yellow to lime-green; legs blackish. Female is markedly smaller than male, particularly in wing length (almost no overlap between sexes); plumage radically different, head and nape blackish-brown with short line of tiny whitish spots as postocular stripe, similar submoustachial stripe immediately beneath gape, upperparts cryptically coloured brown and rufous, chin and throat whitish-grey, grading to pale buff on upper breast and to darker buff on flanks, thighs and undertail-coverts, all uniformly narrowly barred brownish-black; similar to females of some parotias and *Ptiloris magnificus*. Juvenile is like female, but plumage soft and fluffy, with darker crown, rear and side of neck barred ochraceous; immature male like adult female, but mean lengths of wing and tail longer; subadult male variable, like adult female with few feathers of adult male plumage intruding, initially outer primaries becoming black, to like adult male with few feathers of female-like plumage remaining; tail length of male increases slightly with age (varies with race). Race *niedda* is like nominate in appearance and proportionate measurements, but female darker and more ochraceous on underparts; *feminina* has proportionately much longer wing in relation to tail than do others, female similar to *latipennis* but broad superciliary stripes join narrowly across nape; *latipennis* is smaller and lighter than nominate, mean tail length as proportion of mean wing length smaller, female differs from nominate in having head dark brown, broad whitish superciliary stripe, white streaking on forehead, crown and nape, upperparts variably olive-tinged brown,

chin and throat whitish; *minor* has mean wing length shorter than all others, tail shorter than all except *feminina*, female blacker than preceding race, head and throat more blackish-brown, superciliary stripe reduced to small postocular streak, little or no pale nape marking, upperparts rich dark chestnut. Voice. Advertisement of male a loud, metallic, nasal series of 4–7 (sometimes many) "shre" or "scheee" notes, initial ones softer and more slowly delivered, then each becoming louder and faster until slowing toward end. In Kubor Range, song described as harsh, grating "au-aa-aa-aah" screech starting softly and building in volume, to fade at end; continuously repeated notes of Vogelkop males said to resemble "mjat-mjat". Display occasionally preceded by clockwork-like hiss. During courtship, male produces loud, sharp "click tick-tick" or "tick" (singly or continuously repeated) by sudden movement of wings; sharp ticking may be produced also in flight.

Habitat. Middle to upper montane forests, disturbed forest, and forest patches among gardens and other cleared areas; 1000–2300m, mostly 1650–1900 m. Male territories centred on ridge crests, with preference for steeply sloping spurs or flanks of large ridges for song perches.

Food and Feeding. Fruits (mostly capsules) and variety of arthropods; proportions vary seasonally, from nearly all arthropods to almost entirely fruits. Typically forages at all levels, by hopping about small trees and tree limbs which are covered with moss and other epiphytic growth. Probes and tears into moss and other growth for arthropods; occasionally sallies for fruits. Usually solitary and slow-moving, but joins mixed-species foraging flocks, including other birds-of-paradise, in fruiting trees.

Breeding. Breeds in any month across range; nest-building recorded in Apr, egg-laying Jan, Mar, Jun and Nov, and female feeding fully developed begging juvenile Feb–Mar in C New Guinea (Mt Bosavi); display observed during Aug–Jan. Polygynous, solitary promiscuous male advertisement-singing from traditional high exposed perch(es); female builds and attends nest alone. Males territorial, within auditory contact of rivals, display on low perch, tree trunk or flat ground to high perch; territories of three males non-overlapping but abutting, average size 1·5 ha, average of 140 m between males (which were at all times in vocal or visual contact); territory of individually marked adult male on Mt Bosavi estimated at 150 m in diameter, but territory near Kompiam R considered significantly smaller. Courtship involves static display, and an animated dance with wing-flicking and leg-flexing, erection of nuchal cape, pectoral shield and forecrown feathers, and gaping; Initial Display activity followed by high-intensity phases. One nest was a loosely made rough cup, mostly of dark springy rootlets and fibres with a few large dead leaves and with small *Polypodium*-type fern fronds and strands of a *Selaginella*-like creeping plant incorporated, another a deep substantial cup of leaves with vine-like tendrils, quite possibly epiphytic orchid stems, and some living *Pyrrosia* fern stems with fronds on outside and rim; built at 1·5 m or higher in crown of palm or structurally palm-like plant. Clutch 1–2 eggs; in captivity, incubation period 18–19 days and nestling period once 18 days.

Movements. Presumably resident.

Status and Conservation. Not globally threatened. CITES II. Locally common. Commonest bird-of-paradise within its altitudinal range (c. 1060–2135 m) in Eastern Highlands. Common in riverine forests bordering Wahgi R (1524 m) and in Kubor foothills to 2226 m; not uncommon in tall middle montane forest edges but not found above c. 1800 m in Victor Emanuel Mts and Hindenburg Mts. More abundant at lower elevations of range (where individuals predominantly in female-like plumage) during non-breeding season. At Tsuwenkai (in Bismarck Range), estimated density 1 male/2·3 ha (1/2·7 ha in primary forest, 1/1·8 ha at forest edge). Marked change in composition of population noted with altitude: at 1220–1280 m only a single immature male; at 1341–1448 m two female-like birds; at 1448–1643 m numerous female-plumaged birds, and an adult male calling at 1560 m; at 1643–1817 m adult males common and females only up to 1738 m, and above this few birds seen were all adult male. Very common in Feb–Mar in middle and upper canopy in Adelbert Mts, where adult males dominated at 1500–1600 m and female-plumaged individuals much more common at 1200 m.

Bibliography. Beehler (1989a), Beehler & Pruett-Jones (1983), Coates (1990), Cracraft (1992), Crandall (1931), Diamond (1972), Frith, C.B. & Beehler (1998), Frith, C.B. & Frith (1996b, 1997b), Frith, D.W. & Frith (1988), Gilliard (1969), Harrison & Frith (1970), Healey (1986), Junge (1953), Kwapena (1985), Mayr (1930, 1931c, 1962d), McCarthy (2006), Pratt (1982), Pruett-Jones & Pruett-Jones (1986), Salvadori (1896), Schodde (1976), Timmis (1968, 1970), Whiteside & Feignan (1998).



PLATE 25

inches 5

cm 13

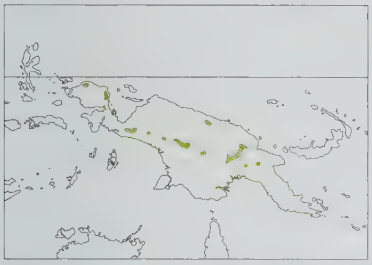
Genus *EPIMACHUS* Cuvier, 1816

27. **Black Sicklebill**

Epimachus fastosus

French: Paradisier fastueux **Spanish**: Ave-del-paraíso Fastuosa
German: Breitschwanz-Paradieshopf
Other common names: Greater Sicklebill, Black Sickle-billed/Black Saber-tailed Bird-of-paradise, Greater Sicklebilled Bird-of-paradise

Taxonomy. *Promerops fastuosus* [sic] Hermann, 1783, Arfak Mountains, New Guinea.
Intergeneric hybridization with *Paradigalla carunculata*, *Astrapia nigra* and *Lophorina superba* recorded. Proposed race *stresemanni* (described from Schraderberg, in Sepik Mts) synonymized with *atratus*. Species name often listed as "*fastuosus*", the spelling first used in the scientific description; however, this spelling was explicitly corrected by original author on later page of same work. Three subspecies recognized.
Subspecies and Distribution.
E. f. fastosus (Hermann, 1783) – Vogelkop (Tamrau Mts and Arfak Mts), in NW New Guinea.
E. f. atratus (Rothschild & E. J. O. Hartert, 1911) – mountains of Wandammen Peninsula, and C Cordillera E to Kratke Range, in E New Guinea.
E. f. ultimus Diamond, 1969 – Bewani Mts (Menawa) and Torricelli Mts (Mt Somoro), in N New Guinea.



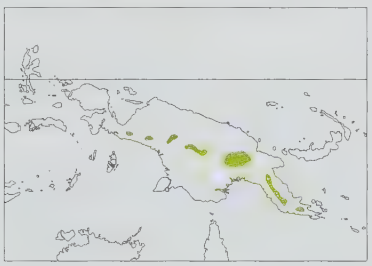
Descriptive notes. Male 63 cm (110 cm including central rectrices), 250–318 g; female 55 cm, 160–255 g. Large paradisaeid with long, sickle-shaped bill and greatly elongated central tail feathers. Male nominate race has entire head black, scale-like feathers showing iridescence of metallic green-blues with purple and/or magenta washes; chin tuft and throat blackish with only slightest magenta sheen; velvety black above, mantle to uppertail-coverts with violet-purple and/or magenta iridescence, large scale-like central back feathers with highly metallic blue-green iridescence, upperwing with variable blue to violet-purple and/or magenta sheens; primaries blackish-brown; uppertail blackish-brown with iridescent purple except central feather pair, which iridescent metallic blue-purple to violet-purple and/or magenta; upper breast brownish-black, grading to slightly paler browner on lower breast and to sepia on elongate filamental flank plumes, vent and undertail-coverts (black of underparts may show plum-purple sheen); greatly enlarged axehead-shaped pectoral plumes black with metallic dark magenta iridescence, and shorter overlying ones broadly tipped iridescent metallic blue, purple and/or violet; elongate modified feathers on each side of belly and vent with highly iridescent metallic deep purple-blue to violet-purple broad tips, tapering distally; iris bright blood-red; bill black, mouth bright yellow; legs blackish-grey. Female is markedly smaller than male, particularly in tail, has brown iris and radically different plumage, with no iridescence; cryptically coloured in various shades of dark brown dorsally, more reddish-brown on forehead, crown, nape, greater coverts and flight-feathers; face, chin and throat to upper breast dark brown, rest of underparts pale buff with dark brown barring, bars on breast becoming increasingly broad down on to lower breast and belly, with even broader barring on flanks, vent and undertail-coverts. Juvenile is like adult female, but crown and upperparts more rust-red, plumage soft and downy below, browner on chin and throat, underparts more buff; immature male like adult female, but tail on average longer and primaries more tapered and pointed; subadult male variable, ranges from like adult female with few adult male feathers intruding to much like adult male with few female-like feathers remaining, lacks specialized tail feathers of adult male, acquires progressively longer tail with age, central feather pair more than doubling in length. Race *atratus* differs from nominate in darker ventral plumage of adult male; *ultimus* has bill shorter than other races, male differs from nominate in being more black, less brown, on underparts, female in having tail longer and more olive, less rufous. Voice. Advertisement calls of males regionally variable, but best known is loud ringing, upslurred whip-like "qwink qwink!", which may be repeated or given as series of single notes, and audible beyond 1 km; transcribed also as e.g. "whik whik"/"kwik kwik"/"bwink bwink", or "blick blick"/"blit blit", or "buk buk"/"bek kek". Other, uncommonly given calls include guttural notes and honking, a growled deep "grr-grrk grr k-wick!" or "guck-er-ruk bl-whit!". Loud whistled "whick" by adult male in display; also a quiet rattle (sounding like distant machine gun) during horizontal display posture. Adult male in Arfak Mts (nominate race) started display with loud "du dug....du dug" song, and repeated this later during display.
Habitat. Middle montane forest, occasionally at forest edge, mostly in primary forest; more rarely in adjacent second growth and garden edges. At 1280–2550 m, mainly in narrow elevational zone of 1800–2150 m; predominatly at lower elevation than *E. meyeri*.
Food and Feeding. Fruits and animals in about equal proportion; animal food includes insects and small vertebrates. Forages primarily in middle and upper forest stages, often by bounding from perch to perch; also descends to ground.
Breeding. Breeds at least Nov–Feb (wet season); males with enlarged gonads Apr–Sept, a female with large eggs in oviduct early Feb (Baiyer Valley), juvenile seen mid-Feb on Mt Goliath (WC New Guinea) and juvenile early Nov at Mt Giluwe (E New Guinea); display Sept, Oct and Feb–Apr, peak activity near Crater Mt (E New Guinea) in late Sept. Polygynous, solitary promiscuous male advertisement-singing/displaying from traditional perches; female builds and attends nest alone. Each adult male frequents home range with singing/display perches typically high in forest, rarely to ground level. Courtship display performed atop broken-off vertical tree trunk, involves static posture, leg-flexing while leaning to horizontal and swaying with erect pectoral, flank and tail plumes, and possibly mouth gaping, mostly in pre-dawn twilight; some upright display postures similar to those of *E. meyeri* (see page 439), but will also stretch forwards to assume near-horizontal position and sway side to side while giving quiet rattle call (like soft knocking on empty box); one observed to adopt head-down crouched posture, tail cocked at more than 45°, as mouth widely gaped at a female below; one male dived c. 30 m downwards to within metres of forest-floor shrubs, then turned upwards and sailed back up on spread wings to original perch. A nest found on Mt Giluwe was of orchid stems, with vines and moss on base, placed on forked tree branch 10 m above ground. No other information.
Movements. No information.
Status and Conservation. VULNERABLE. CITES II. Mostly uncommon or rare; apparently locally common but at low density above 1800 m on Mt Bosavi; thought to be common in Tamrau Mts, probably locally common in Arfak Mts. Estimated population in range c. 2500–10,000 individuals, and declining as a result of exploitation. Much of this species' favoured elevational zone is heavily settled by humans, and many potentially suitable areas have been cleared; uncommon on Mt Giluwe, where habitat had been degraded by logging and agriculture; does not generally favour secondary forest. This species is hunted both for its tail feathers and for food. Skins becoming increasingly valuable, hunters targeting adult males; hunting pressure increasing as shotguns become more widely available and as human populations increase within species' altitudinal range. Following heavy hunting with firearms around the Ok Tedi copper mine, decline in bird numbers was so dramatic that it was thought that this species may have approached a "minimum survival level"; shooting there continued until at least as recently as 1994. Prior to designation of Crater Mt as a Wildlife Management Area, the people of Ubaigubi considered this species vitually extinct there owing to hunting for traditional purposes. Forest in its favoured altitudinal range is under considerable pressure from large and increasing human population, which continues to clear large areas for agriculture.
Bibliography. Anon. (2008j), Bell (1969a), Butchart & Stattersfield (2004), Coates (1990), Cracraft (1992), Diamond (1969, 1972), Frith & Bechler (1998), Frith & Frith (1997b), Gilliard (1969), Gilliard & LeCroy (1961), Hartert (1930), Junge (1953), Kwapena (1985), Majnep & Bulmer (1977), McCarthy (2006), Peckover & Filewood (1976), Ripley (1957), Rothschild (1931), Stattersfield & Capper (2000).

28. **Brown Sicklebill**

Epimachus meyeri

French: Paradisier de Meyer **Spanish**: Ave-del-paraíso de Meyer
German: Schmalschwanz-Paradieshopf
Other common names: Meyer's Sicklebill, Brown/Meyer's Sickle-billed Bird-of-paradise, Grey Saber-tailed Bird-of-paradise

Taxonomy. *Epimachus Meyeri* Finsch and A. B. Meyer, 1885, Hufeisengebirge [Horseshoe Mountains = Mount Maguli], south-eastern New Guinea.
Intergeneric hybridization unrecorded in wild, but species crossed with *Astrapia mayeri* in captivity. Proposed race *megarhynchus* (described from Gebroeders Mts, in Weyland Range) synonymized with *albicans*. Three subspecies recognized.
Subspecies and Distribution.
E. m. albicans (van Oort, 1915) – C Cordillera of New Guinea from Weyland Mts E to Hindenburg Mts and Victor Emanuel Mts.
E. m. bloodi Mayr & Gilliard, 1951 – mountains of E New Guinea from at least Mt Hagen and Mt Giluwe (probably from Doma Peaks/Tari region) E to Kratke Range just W of Watut/Tauri Gap.
E. m. meyeri Finsch & A. B. Meyer, 1885 – mountains of SE New Guinea E from Mt Missim (E of Watut/Tauri Gap) and Ekuti Range.



Descriptive notes. Male 49 cm (96 cm including central rectrices), 144–310 g; female 52 cm, 140–202 g. Large paradisaeid with long, sickle-shaped bill and long, graduated tail with greatly elongated sabre-shaped central rectrices. Male nominate race has entire head black, in certain lights scale-like feathers of crown and face showing metallic green-blue iridescence with purple and/or magenta washes, chin, throat and entire neck black with iridescent magenta feather tipping; black above, mantle and back with green-blue and/or magenta sheens, modified large scale-like central back feathers highly iridescent metallic blue-green, rump with purple or plum gloss; velvety black upperwing with variable blue-green, blue to purple or plum gloss or sheen; brownish-black uppertail with blue iridescent sheen on outer webs, elongated central feather pair iridescent metallic green-blue and/or magenta; dark brown breast, increasingly washed with plum-purple at side; greatly enlarged axehead-shaped pectoral plumes black with metallic dark magenta iridescence, shorter overlying ones broadly tipped iridescent metallic blue, purple and/or violet; elongate modified feathers on each side of breast, belly and vent with highly iridescent metallic purple and/or magenta broad (but tapering) tips, sparse filamental flank plumes variable fawn-brown with paler, straw-coloured, central shafts; vent and undertail-coverts olive-brown; iris pale chalk-blue; bill black, mouth bright yellow; legs dark greyish to blackish. Female is markedly smaller than male, particularly in tail, has plumage radically different, lacking iridescence; cryptically coloured in various dark browns dorsally, but more reddish-brown on forehead, crown and nape, darker brown upperwing with raw umber edging to remiges and greater coverts; face blackish, chin and throat dark sooty-brown, finely flecked dull buff, underparts greyish-white to light buff with regular blackish-brown barring throughout, slightly paler barring towards rear. Juvenile is like adult female, but crown and mantle brighter and more rust-coloured, general plumage soft and fluffy, especially on abdomen; immature male like adult female, but tail longer; subadult male variable, from much like adult female with few feathers of adult male plumage intruding to like adult male but with few female-like feathers remaining, young male first acquires darker crown than adult female and blackish feathering around eyes, lores, bill, chin and upper throat, followed by adult head plumage and then, with subsequent moults, an increasing proportion of adult plumage; male acquires progressively longer tail with age, central feather pair more than doubling in length. Race *bloodi* is similar to nominate but is considerably smaller, with male flank plumes paler, rather more dirty whitish; *albicans* is also similar to nominate but is slightly smaller, with male flank plumes whitish. Voice. Advertisement song of male sounds like a burst of automatic machine-gun fire, with slight geographical variations, in SE of range "tat-at, tat-at, tat-at" but in Central Highlands "tat-at-at-at, tat-at-at-at-at-at"; audible at distance of up to 2 km. A foraging or contact call is rendered as a nasal "nreh!" or a rising "wahn"; other vocalizations and mechanical sounds (drumming, snapping, cracking) have been noted, but are not yet adequately described. Notes produced by individuals in female-like plumage are chicken-like and a barking "ugh!".

On following pages: 29. Buff-tailed Sicklebill (*Drepanornis albertisi*); 30. Pale-billed Sicklebill (*Drepanornis bruijnii*).

Habitat. Middle and upper montane forests, including moss forest, also disturbed forest, secondary growth and forest edge; 1500–3200 m, mainly 1900–2900 m.
Food and Feeding. Fruits (mainly drupes), also arthropods and small vertebrates, in fairly equal proportions. Fruits and arthropods fed to nestlings. Forages from ground to canopy, mostly in middle stages of forest interior. Probes into and tears epiphytic plant growth, mostly using bill to locate animals within debris between bases of pandanus (*Pandanus*) fronds. Often solitary, but not uncommonly forages in company of conspecifics or other birds-of-paradise (especially *Astrapia*). Adult male appears to forage within a home range from which it excludes other adult males, but permitting individuals in female-type plumage to feed there.
Breeding. At least Apr–Jan; males with gonads moderately enlarged in Jan–Feb, Apr and Jun and much enlarged in Jul–Dec, female with oocytes moderately enlarged in Mar, Jul and Dec and much enlarged in Jan; in Wau area of SE New Guinea, recently fledged juvenile at Bulldog Road mid-Dec and another on Mt Kaindi early Mar; display at least Feb, May–Aug and mid-Dec on Mt Hagen, also Sept–Dec in Tari Gap. Polygynous, solitary promiscuous male advertisement-singing/displaying from one or more traditional perches; female builds and attends nest alone. Male maintains large territory containing display perches (usually near-horizontal or gently sloping branches) in forest canopy, upper middle stage or substage near centre of territory, perches sometimes regularly dispersed along ridges; counter-singing at territorial boundaries possibly maintains male dispersion, but most singing performed at display sites defended against rival males. Main courtship displays include static posture, leg-flex to lean and sway, incorporating movements of pectoral, flank and tail plumes, and gaping; three phases recorded, respectively the Pumping, Leaning and Upright postures. Nest a shallow bowl of stringy living mosses, fern fronds, leaves, grasses and/or slender vines, lined with slender brownish rootlets, orchid and fern stems, dried fern tips, small leaves and many skeletonized leaf fragments, placed c. 4–12 m above ground in crown of pandanus or tree-fern or in small tree. Clutch 1 egg; no information on incubation and nestling periods.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Central Papuan Mountains EBA. CITES II. Common to abundant over much, if not most, of range; uncommon or absent in some apparently suitable habitats. In 350 ha on Mt Missim, at least ten adult males resident, with nearest-neighbour distance 270–440 m (mean 332 m). Adult males rare in Baliem and Ilaga Valley areas (W New Guinea) in mid-1950s and 1960 owing to traditional hunting; in Kaironk Valley (Schrader Range, in E New Guinea), species was much less in evidence in 1970s than in 1960s. Lives in altitudinal range above that where most clearing of forest for human habitation and agriculture occurs; probably in no immediate danger.
Bibliography. Beehler & Pruett-Jones (1983), Coates (1990), Cracraft (1992), Crandall (1932, 1941, 1946), Diamond (1972), Forshaw & Cooper (1977), Frith & Beehler (1998), Frith & Frith (1992a, 1997b), Gilliard (1969), Gilliard & LeCroy (1961), Gyldenstolpe (1955a), Kwapena (1985), Majnep & Bulmer (1977), Mayr & Gilliard (1954), Mayr & Rand (1937), Timmis (1972).

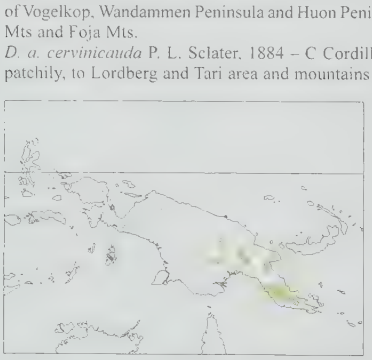
Genus *DREPANORNIS* P. L. Sclater, 1873

29. **Buff-tailed Sicklebill**

Drepanornis albertisi

French: Paradisier d'Albertis **Spanish**: Ave-del-paraíso de Albertis
German: Gelbschwanz-Paradieshopf
Other common names: Black-billed/Red/Short-tailed Sicklebill, Black-billed/D'Albertis's Bird-of-paradise

Taxonomy. *Drepanephorus albertisi* P. L. Sclater, 1873, Hatam, Arfak Mountains, New Guinea.
Genus sometimes subsumed in *Epimachus*. Possibly forms a superspecies with *D. bruijnii*. Birds from Huon Peninsula sometimes recognized as race *geisleri*; further study required. Proposed race *inversus* (described from Mt. Kunupi, in Weyland Mts) synonymized with *cervinicauda*. Two subspecies recognized.
Subspecies and Distribution.
D. a. albertisi (P. L. Sclater, 1873) – non-Cordilleran ranges of New Guinea, including mountains of Vogelkop, Wandammen Peninsula and Huon Peninsula, and presumably also Fakfak Mts, Kumawa Mts and Foja Mts.
D. a. cervinicauda P. L. Sclater, 1884 – C Cordillera of New Guinea from Weyland Mts E, very patchily, to Lordberg and Tari area and mountains of SE New Guinea.



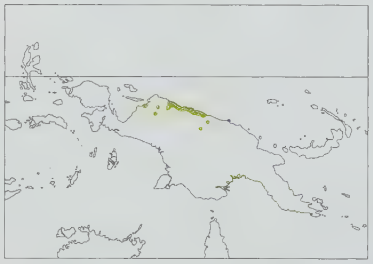
Descriptive notes. Male 35 cm, 103–125 g; female 33 cm, 92–138 g. Fairly large paradisaeid with very long, sickle-shaped bill and medium-length tail. Male nominate race has head variably cinnamon-brown, browner on crown, where feathers tipped iridescent coppery purple; lores, chin and throat blackish, strongly tainted iridescent leaf-green; elongate forecrown feathers form "horn" above front edge of each eye, with some shorter feathers tipped iridescent purple-blue and longer ones magenta; bare facial skin dark maroon-grey; upperparts and upperwing cinnamon-brown, rump and uppertail-coverts paler, tertials and primaries with broad cinnamon leading edges; uppertail pale cinnamon; sooty-brown to sooty-grey upper breast separated from lower breast and flank plumes of same colour by band of feathers broadly tipped iridescent violet-purple with magenta wash; loosely structured pectoral plumes iridescent bronze with magenta wash, and similarly structured elongate flank plumes broadly tipped purple; central belly, vent and undertail-coverts white; iris dark brown; bill shiny black, mouth pale green or pale yellow; legs brownish to greyish or blackish. Female is similar to male in size and weight, lacks iridescent feathering, but otherwise similar above to adult male but darker and more amber on tail; chin and throat cinnamon-brown with fine pale, buffy central feather shafts, underparts barred dark brown throughout except on lower breast, where feather barring forms chevrons. Juvenile undescribed; immature like adult female, but with longer tail than both adult sexes; subadult male varies, from similar to adult female with few feathers of adult male plumage intruding to much like adult male but with few feathers of female-like plumage remaining; adult male plumage exhibited patchily for at least one breeding season, horns over eyes usually acquired at same time as iridescent green throat, iridescent purple-tipped flank plumes and extensive central breast patch of olive-brown, barred female-like plumage remaining above and below latter; male tail length decreases slightly with age. Race *cervinicauda* is smaller than nominate, with proportionately shorter tail, paler uppertail-coverts and tail, underparts of birds in female-type plumage pale buff with paler brown barring. Voice. Male advertisement song a high, powerfully whistled, musical "dyu dyu dyu dyu dyu dyu dyu...", increasing in speed and rising (sometimes falling) in pitch; contact a plaintive "wrenh"; display call a variable elaboration of advertisement song but higher, more insistent, faster, ending with sibilant "tish-tish-tish-tish-tish-tish-tish-tish" or "ki-ki-ki-ki-ki-ki-ki". One male preceded displays by whistling "to to to to to to to to" followed by harsh but softer note. Vocalization on Fakfak Mts a series of downslurred whistles slightly decelerating and rather slowly delivered, distinct from that on Arfak Mts, which is a much more rapidly delivered trill like that of a Whimbrel (*Numenius phaeopus*).
Habitat. Middle montane forests, infrequently logged areas and forest edge; 600–2250 m, mainly 1100–1900 m.
Food and Feeding. Primarily insectivorous, taking various arthropods, but also fruits (mostly capsules). Forages mostly in middle and upper levels of forest. Gleans, prises, and probes bark, dead wood, limb surfaces, mosses, dead leafy debris and knotholes for prey; uses bill as forceps to pick up items or to remove fruit from capsular husks; entire bill or either upper or lower mandible used for probing holes. At least individuals in female-type plumage join mixed-species foraging flocks.
Breeding. Breeds at least Sept–Dec, and birds with enlarged gonads noted Feb–Oct over entire range, but little studied; a begging juvenile following its mother at end Nov; display season at Mt Missim (E New Guinea) May–Nov, virtually silent in intervening months, and mating mostly Oct–Nov or shortly before or after in EC New Guinea. Polygynous, solitary promiscuous male advertisement-singing/displaying from one or more traditional perches; female builds and attends nest alone. Adult male territorial, occupying and defending large display/foraging all-purpose territory all year, adjacent males in auditory contact from high posts, displays at habitual site involving several perching areas, descending to saplings to court females; display calls typically given in lower forest, to within a metre of ground; an individually marked male's territory was c. 14 ha (mean nearest-neighbour distance between display sites of five males 450 m, at dispersed posts in 200 ha of forest), his display site, used for at least four years, a small area in old-growth forest near centre of his home range. Courtship display involves static and inverted postures and movements of pectoral, flank and head plumes, and possibly gaping. Only nest known was a thin, rather flat structure with slight egg-cup depression, foundation of pale reddish-brown wiry grasses, lining of black wiry roots, placed in fork of thin branch between horizontal bough and trunk. Clutch 1 or 2 eggs; no information on incubation and nestling periods. Male ringed when in adult plumage lived for at least a further 9 years, and thus reached more than 15 years of age.
Movements. Presumably resident. A female was silent while moving about her 43-ha range during period of eight days.
Status and Conservation. Not globally threatened. CITES II. Nowhere abundant; may be absent from apparently suitable areas of habitat, especially in C parts of New Guinea. Although thought not to be at any immediate risk, this species probably merits monitoring.
Bibliography. Beehler (1983a, 1987a), Beehler & Pruett-Jones (1983), Diamond (1972, 1985, 1987b), Frith & Beehler (1998), Frith & Frith (1997b), Gibbs (1994), Gilliard (1969), Hartert *et al.* (1936), Mayr (1931c), Opit (1975), Schodde (1976), Sharpe (1891–1898).

30. **Pale-billed Sicklebill**

Drepanornis bruijnii

French: Paradisier à bec blanc **Spanish**: Ave-del-paraíso Piquiblanca
German: Braunschwanz-Paradieshopf
Other common names: White-billed/Lowland Sicklebill, White-billed/Bruijn's Bird-of-paradise, White-billed Sicklebill(ed) Bird-of-paradise

Taxonomy. *Drepanornis Bruijnii* Oustalet, 1880, coast of Geelvink Bay between 136°30' and 137° of longitude, New Guinea.
Genus sometimes subsumed in *Epimachus*. Possibly forms a superspecies with *D. albertisi*. Monotypic.
Distribution. N New Guinea from E side of Geelvink Bay E through Meervlakte (Lakeplain) and presumably Idenburg (Taritatu) basin and N coastal lowlands to Vanimo area and NW reaches of Sepik R drainage (Utai).



Descriptive notes. Male 35 cm, 160–164 g; female 34 cm, 184–207 g. Fairly large paradisaeid with very long, sickle-shaped pale bill and medium-length tail. Male has forehead, crown and anterior loral area variable dark brown, elongate feathers above eye forming erectile tuft that is iridescent blue-purple and/or red-purple in certain lights; chin, throat and ear-coverts darker, velvety blackish-brown, with leaf-green iridescence; extensive bare facial skin lead-grey with slight purple hue, small roughly circular patch of strongly iridescent blue to purple fine scale-like feathers below eye and over base of lower mandible; mantle and upper back dull brown, becoming cinnamon-brown on lower back, rump and uppertail-coverts; upperwing brown, with narrow richer and slightly paler cinnamon leading edges of greater coverts, tertials and secondaries, and paler edges to primaries; uppertail cinnamon-brown; upper breast dark olive-brown, extensive tips of longer feathers (including elongate feathers covering bases of pectoral plumes) iridescent olive-green; pectoral plumes dark greyish-brown, shorter row broadly tipped strong iridescent coppery red, these overlying longer ones that are finely tipped iridescent purple and/or blue; grey feathers of side of lower breast with iridescent leaf-green broad tipping, beyond these a line of jet-black feathers finely tipped with iridescent purple and/or blue; remaining parts of breast and belly dark warm grey with dark lavender wash, thighs, vent and undertail-coverts paler, more greyish-brown; iris dark brown; bill ivory-whitish; legs purplish-brown. Female is similar in size to male but lighter in weight, lacks iridescent feathering; like adult male above but paler, more buff; different below, chin to upper breast buff, becoming darker on lower breast and paler cinnamon on belly, vent and undertail-coverts; chin and throat finely flecked blackish-brown, otherwise regularly barred blackish-brown below. Juvenile undescribed; immature male like adult female, but tail longer than adult of both sexes; subadult male variable, from similar to adult female with few feathers of adult male plumage intruding to like adult male with few feathers of female-like plumage remaining, acquires dark throat feathers and pectoral plumes first, with partial warm grey of underparts only and much barring retained, and gains more grey

dorsal feathering as barring diminishes with subsequent moults; male tail length decreases slightly with age. Voice. Male advertisement call a variable series of hoarse or hollow whistled plaintive musical notes, each rising or falling in pitch, sometimes preceded or followed by one or more low musical gurgles or coughs, e.g. "wik-kew kwéér kwéér kwer, kor kor kor", moderately high-pitched and carrying considerable distance. During foraging a quiet interrogative "whehn", similar to that of several other members of family.

Habitat. Lowland rainforest, including disturbed areas, and original and selectively logged forest on limestone hills; sea-level to 180 m.

Food and Feeding. Fruits (mainly drupes) and arthropods. Appears to be more frugivorous than *D. albertisi*. Forages mostly in canopy, but descending to substage to join mixed-species foraging flocks, including other paradisaeids and pitohuis (*Pitohui*).

Breeding. Gonadal enlargement at Holtekong (Hollekang), near Jayapura, suggests nesting in Nov; display at least in Aug. Polygynous, solitary promiscuous male advertisement-singing from one or more traditional perches; female builds and attends nest alone. Adult male territorial, exclusively occupying and defending large area used for both display and foraging (some sharing of foraging range at least as part of mixed flocks); patrols territory daily, singing at different points and counter-singing and counter-displaying to neighbouring rival males. Display involves at least a static posture with movements of pectoral and flank plumes, fanned tail, and gaping, but incompletely known; in one posture male perches upright, with short upper pectoral plumes erected vertically, longer lower feathers erected into wide skirt, and tail fanned, holding this pose with little movement for up to ten seconds and conspicuously rattling bill. No other information.

Movements. Presumed resident.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in North Papuan Lowlands EBA. CITES II. Poorly known. May be widespread and locally quite common, even in selectively logged forest, within its geographically rather small range. Four singing males heard from a single vantage point on one roadside. Home range of a male near Puwani R (in E of range) over 7 days was c. 15 ha. Population thought probably to be declining owing to habitat loss and degradation, as lowland forest throughout its range are under pressure for development and commercial trade in timber.

Bibliography. Anon. (2008j), Beehler & Beehler (1986), Beehler & Pruett-Jones (1983), Butchart & Stattersfield (2004), Collar *et al.* (2001), Diamond (1972, 1981), Frith (1998), Frith & Beehler (1998), Frith & Frith (1997b), Hartert (1930), Ripley (1964), Stattersfield & Capper (2000), Whitney (1987).


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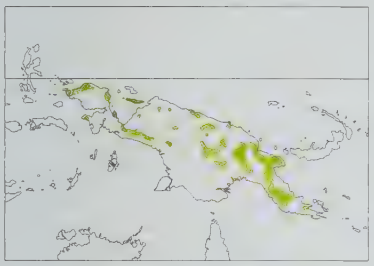
Genus *CICINNURUS* Vieillot, 1816

31. **Magnificent Bird-of-paradise**

Cicinnurus magnificus

French: Paradisier magnifique **Spanish**: Ave-del-paraíso Magnífica
German: Sichelschwanz-Paradiesvogel

Taxonomy. *Paradisea Magnifica* J. R. Forster, 1781, Arfak Mountains, New Guinea.
Present species and *C. respublica* sometimes separated from *C. regius* in genus *Diphyllodes*. Hybridization with *C. regius* and, intergenerically, with *Paradisaea minor* recorded. Proposed race *intermedius* (described from upper Setekwa R, in Snow Mts) synonymized with *chrysopterus*. Three subspecies recognized.
Subspecies and Distribution.
C. m. magnificus (J. R. Forster, 1781) – West Papuan Is (Salawati) and NW New Guinea (N & E Vogelkop, Wandammen Peninsula and Onin Peninsula).
C. m. chrysopterus (Elliot, 1873) – Yapen I (in Geelvink Bay) and W & C New Guinea E to mountains of Jimi R and Sepik–Wahgi Divide, also Adelbert Range.
C. m. hunsteini (A. B. Meyer, 1885) – E & SE New Guinea from upper Fly R region (E along S scarp of C Cordillera), Wahgi region and Huon Peninsula.



Descriptive notes. Male 19 cm (26 cm inclusive of central rectrices), 75–119 g; female 19 cm, 52–60 g. Male nominate race has upper head and nape feathers short and stubbly, olive-brown with scalloped darker feather tipping on central crown, reddish-brown on side of crown and on ear-coverts; iridescent dark green small spot of loral feathering, jet-black semicircle of feathers above eye; indistinct narrow area of bare pale blue skin behind eye; grossly elongate square-ended hindneck feathers form sulphur-yellow cape refracting white light (as does spun glass), several elongate feathers at side of cape olive-brown to reddish-brown, tipped blackish; back feathers from beneath cape form semicircle of dark carmine, bordered jet-black with white iridescence; reddish to dark brownish-olive lower back and rump, former with white iridescence; uppertail-coverts dark brownish-olive, washed reddish-brown, with dark green iridescence; lesser upperwing-coverts olive-brown, washed reddish-brown, remainder of upperwing dark brownish-olive, with fine buff leading edges on all except outermost primaries, broader on secondaries, modified tertials of frill-edged buff feathers washed orange-yellow, with white iridescence; uppertail dark brownish-olive, central feather pair modified into fine "sickles" (which cross near "normal" tail tip) with narrow web on outer edge only, iridescent metallic green-blue above and olive-brown below; chin and upper throat brownish-black with dark green iridescent sheen; lower throat to lower breast feathers forming extensive breast shield of glossy dark green, elongate lower feathers extending onto belly; line of broadly elongated scale-like feathers extending down ventral mid-line intensely iridescent turquoise, interspersed with dark green barring; feathers of lower and outer breast shield narrowly tipped iridescent turquoise to cobalt-blue; entire shield can produce rich purple and/or magenta iridescence; blackish-brown belly to undertail-coverts with slightest wash of violet-purple in certain lights; iris dark brown; bill chalky pale grey blue, upper ridge of culmen not sharply keeled to knife edge (unlike congeners), mouth pale green; legs blue. Female is slightly smaller than male, notably in weight, but tail (excluding central rectrices) longer; plumage radically different, cryptically drab-coloured olive-brown to reddish-brown above, richer on face and darkest on lores, wings somewhat brighter than mantle, thin line of pale blue skin behind eye (as on male), chin olive-brown and throat dirty white, flecked brown, underparts pale, uniformly barred dark brown; bare parts as for male, but bill duller. Juvenile undescribed; immature male like adult female, but bill blackish-brown, older birds with orange on secondaries and wing-coverts, mouth of younger birds (less than two years or so) orange; older birds in female-type plumage develop narrow, pointed and increasingly longer central rectrices prior to acquiring wire-like sickles of adult; subadult male variable, like adult female with few feathers of adult male plumage intruding, initially on head, to like adult male with few feathers of female-like plumage remaining, full adult plumage not acquired until at least six years; with age, male acquires progressively shorter outer rectrices while simultaneously gaining longer central pair. Race *chrysopterus* is nearly identical to nominate in both sexes, but secondary coverts and outer edges of flight-feathers more orange, less yellow, and crown darker; *hunsteini* is like nominate but paler on head and back, with brighter orange on secondary coverts and outer edge of flight-feathers, all measurements (both sexes) fractionally smaller than for other races. Voice. Court advertisement song of male a strident "ca cru cru cru", or loud clear "car" or "cre" repeated a number of times, or hoarse or squeeling "caaat ca ca ca". Male at court also produces a series of plaintive, downslurred churrs, single metallic downslurred "kyong" note, loud, sharp "kyerng!", scolding "ksss-kss-ks-ks-ks–kss"; low spitting and clucking notes or scolds when disturbed. In low-intensity courtship male gives low enticing "eek" or "eeeor" notes or "cheeeung"; during Dancing Display a peculiar, low, rhythmic, hard, clicking, buzzing song with higher and lower notes. Female and immature male utter 1–3 harsh, downslurred, quiet "chew" notes, or shortened soft form of adult male call. Adult male may produce audible clacking or rattling sound in flight.
Habitat. Hill forest to lower montane forest, rarely in lowland rainforest; from near sea-level (where hilly) to 1780 m, mainly to 1400 m. Courts are on steep slopes, notably in treefall or landslip areas beneath a gap in forest canopy.
Food and Feeding. Fruits and animals, latter including wide variety of insects, also spiders (Araneae); possibly also flowers or nectar. Nestlings fed at least with fruits. Forages solitarily in all forest strata, mostly in middle and lower levels; adult males more in understorey and commonly join mixed-species foraging flocks.
Breeding. Season at least Jul–Dec, but probably in all months over its range; males with much-enlarged gonads Mar–Nov, and females in breeding condition Feb–Mar and May–Nov; displays performed possibly throughout year, but mostly Jul–Feb. Polygynous, solitary promiscuous male clearing traditional terrestrial court; female builds and attends nest alone. Court several to many square metres in extent, contains vertical saplings, court-owners spending much time on stems of these, which they defoliate and wear smooth by use, court may be maintained for at least three consecutive years; male non-territorial, but maintains home range around court which overlaps with those of one or more other adult males, mean nearest distance between five males at courts on Mt Missim (SE New Guinea) 209 m; males maintain auditory contact by calling while moving about home ranges; females have home ranges overlapping extensively. Courtship displays involve static and leaning postures, and dancing up and down sapling stems, with complex ritualized progression of movements of nuchal cape, pectoral shield and central rectrices, and gaping; four distinctive phases are Back Display, Breast Display, Cape Display, Dancing Display. Nest mostly of mosses, dry leaves, weeds and/or mammal fur, lined with plant fibres and rootlets, placed c. 1–4 m above ground in pandanus (*Pandanus*) crown or other dense foliage. Clutch 1–2 eggs, mostly 2; in captivity, incubation (of one egg) 18–19 days, nestling period (brood of two) 17 and 18 days.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. CITES II. Widespread, and common. In 2002, within Crater Mountain Wildlife Management Area (E New Guinea), estimates at 432–650 m were 17·9 individuals/km² in primary forest, 3·4/km² in old gardens and 5·4/km² in new gardens, and figures at 651–935 m were 11·6 in primary forest, 31·6 in old gardens and 8·1 in new gardens. Considered not to be at any risk in immediate future. Highland men wear central tail wires of adult males in their hair.
Bibliography. Beehler (1983a), Beehler & Pruett-Jones (1983), Campbell (1977), Coates (1990), Cracraft (1992), Diamond (1972), Everitt (1965, 1973), Frith (1998), Frith & Beehler (1998), Frith & Frith (1997b), Gilliard (1969), Gyldenstolpe (1955a), Hartert (1930), Marsden *et al.* (2006), Mayr & Rand (1937), McCarthy (2006), Meyer (1892), Pratt & Stiles (1983), Rand (1940a, 1940b), Schodde (1976), Thair & Thair (1977).

32. **Wilson's Bird-of-paradise**

Cicinnurus respublica

French: Paradisier républicain **Spanish**: Ave-del-paraíso Republicana
German: Nacktkopf-Paradiesvogel
Other common names: Waigeu/Waigeo Bird-of-paradise, Bare-headed Little King Bird-of-paradise

Taxonomy. *Lophorina respublica* Bonaparte, 1850, Waigeo, off north-west New Guinea.
Present species and *C. magnificus* sometimes separated from *C. regius* in genus *Diphyllodes*. Monotypic.
Distribution. West Papuan Is (Waigeo and Batanta), off NW New Guinea.



Descriptive notes. Male 16 cm (21 cm inclusive of central rectrices), 53–67 g; female 16 cm, 52–60 g. Male has tuft of velvety black feathering about bill base, and largely unfeathered crown and nape, the bright turquoise-blue exposed skin with criss-crossing lines of velvety black fine feathering and copper-bronze iridescent sheens; semicircular cape of brilliant yellow on upper mantle contrasts with crimson rest of mantle, latter bordered by broad black line; upperwing with blackish-brown lesser coverts broadly edged paler brown, darker brown greater coverts and alula with fine dark crimson edging, dark crimson tertials tipped black, brownish-black secondaries with dark crimson leading edges (not reaching tips), and dark brown primaries with finest of crimson leading edges; rump, uppertail-coverts and uppertail blackish-brown, modified central tail "sickles" iridescent violet-purple with magenta sheens; chin and upper throat velvety black with coppery-bronze to purple gloss; mid-throat to belly occupied by extensive breast shield of smooth, oily and glossy emerald-green plumage (appearing blue-purple to red-purple in some lights), tiny central spots of several central throat feathers iridescent turquoise-blue, and broadest outermost feathers of lower shield broadly tipped iridescent turquoise-green; remaining underparts sepia-brown with violet to purple sheen; iris dark brown; bill blackish, upper ridge of culmen sharply keeled to knife edge (as in *C. regius* and *Semioptera*), gape narrowly pale yellow (often concealed), mouth bright yellow to green; legs violaceous cobalt-blue to blue-grey. Female is similar in size to male, but tail longer (excluding central feathers), has crown and nape naked but bare skin darker, more lilac-blue, and less extensive; otherwise radically different, cryptically drab-coloured dark olive-brown to reddish-brown above, rustier on uppertail-coverts, tail warm brown, upperwing dull brown, remiges with narrow rusty margins, primaries duller and greyer to tips, chin pale buff, finely flecked greyish, underparts dilute buff, finely and uniformly barred brown-black; legs duller than adult male's. Juvenile undescribed; immature male like adult female, except that rectrices pointed at tips; subadult male variable, like adult female but few feathers of adult male plumage intruding, initially about head and breast, to like adult male but with few feathers of female-like plumage; with age, male acquires progressively shorter rectrices while simultaneously gaining progressively longer central pair. Voice. Advertisement vocalizations of male include repeated clear powerful, whistled "cheew", "chau", "chow" or "twou" note; this call may be given as series of sharper, metallic frog-like wooden clicks, sometimes followed by 3 clearer and sharper clicks. Other calls include sharp explosive single "keeetch", repeated soft, high-pitched "teel" whistle; also stronger, louder "too-too-too-too-too-too-wit", last note sharply raised in pitch to give whip-crack ending, and in even louder form as "too-too-too-too-too-too-zeet". Scold notes harsh and churring. During display, male gives complex squeaky twitterings in subsong punctuated with guttural burring notes. Adult male in flight around court produces rapidly repeated loud sharp clear dry "tick".
Habitat. Primarily hill forest, more rarely also lowland rainforest and middle montane forest; ranges from hills, at 300 m, to perhaps summits of larger islands (c. 1000–1200 m).
Food and Feeding. Fruits and arthropods; possibly joins mixed-species foraging flocks. No other information.
Breeding. Males with enlarged gonads in May–Jun and Oct, and females with moderately enlarged oocytes in Jun; display season undefined. Polygynous, solitary promiscuous male clearing traditional terrestrial court; female builds and attends nest alone. Court c. 0·5–1 m in diameter, usually in dense forest, preferably in small well-lit clearing around fallen tree, landslide or in close vicinity; male keeps court clean of litter, and removes leaves from sapling display stems growing within court. Display involves static and leaning postures and dance, with movements of nuchal cape, pectoral shield, head and central rectrices, and gaping; male initially responds to female-plumaged visitor with "frozen" posture on base of vertical sapling; several other postures and movements

On following pages: 33. King Bird-of-paradise (*Cicinnurus regius*); 34. Standardwing Bird-of-paradise (*Semioptera wallacii*); 35 Twelve-wired Bird-of-paradise (*Seleucidis melanoleucus*).

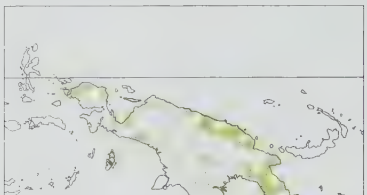
have been observed, and some elements similar to those of *C. magnificus*, but complete successful courtship apparently undocumented. No other information.
Movements. No information.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in West Papuan Lowlands EBA. CITES II. Very poorly known. Population probably fairly small and thought likely to be declining as a result of habitat loss. Was present in fair numbers on Waigeo and fairly common on Batanta I (noted as much more abundant than on Waigeo) during Sept–Oct 1948. Moderately common in tall, mature secondary forest, selectively logged forets and primary lowland and hill forest (c. 60–700 m) on N slopes of Batanta in Feb 1986. Selective logging reported in N Waigeo, where much forest in SE corner was destroyed by fire in 1982; concerns expressed over a cobalt-mining concession on the island. On Batanta (where sole protected area covers just 100 km²), logging activities have caused major habitat degradation and much lowland habitat has been lost to swidden agriculture, but this species seems to be moderately common in logged forest and is probably secure at higher elevations. In addition to slow decline through habitat loss, it is hunted for skins in some areas.
Bibliography. Anon. (2008j), Attenborough (1996), Butchart & Stattersfield (2004), Collar *et al.* (2001), Frith (1974, 1998), Frith & Beehler (1998), Frith & Frith (1997b), Greenway (1966), Gyldenstolpe (1955b), Rothschild (1932), Stattersfield & Capper (2000), Winterbottom (1928).

33. **King Bird-of-paradise**

Cicinnurus regius

French: Paradisier royal **German**: Königsparadiesvogel **Spanish**: Ave-del-paraíso Real
Other common names: Little King Bird-of-paradise

Taxonomy. *Paradisea regia* Linnaeus, 1758, Aru Islands, New Guinea.
Hybridization with *C. magnificus* recorded. Proposed races *rex* (described from Sorong district, in Vogelkop) and *gymnorhynchus* (from near Finschhafen, on NE coast of Huon Peninsula) synonymized with nominate, and *cryptorhynchus* (from Taua, on lower Mamberamo R) and *similis* (from Stephansort, in Astrolabe Bay) treated as synonyms of *coccineifrons*. Two subspecies recognized.
Subspecies and Distribution.
C. r. regius (Linnaeus, 1758) – West Papuan Is (Salawati, Misool), Aru Is, and scattered localities in mainland New Guinea except N portion.
C. r. coccineifrons Rothschild, 1896 – N New Guinea from E coast of Geelvink Bay E to E Ramu R.



Descriptive notes. Male 16 cm (31 cm inclusive of central rectrices), 43–65 g; female 19 cm, 38–58 g. Very small paradisaeid with upper ridge of culmen sharply keeled to knife edge (as in *C. respublica* and *Semioptera*). Male nominate race has crimson head, chin, breast and upperparts, more orange on forecrown and tuft of elongate plush feathering over culmen base, discrete spot of black feathering above central eye showing iridescent dark green; elongate mantle "cape" feathers, back, rump, tertials and some upperwing-coverts crimson to carmine with intense white iridescence, uppertail-coverts duller, more orange (less glossy crimson); upperwing predominantly glossy crimson, flight-feathers and some coverts variably brown; uppertail dark brownish-olive with brown-orange outer feather edges, elongated central feather pair reduced to fine bare red-brown central shafts with remarkable terminal spiral discs, latter (formed of inner feather web) iridescent metallic dark green with bronzed-yellow sheen; lowermost crimson throat feathers finely tipped pale buff where they meet narrow breast shield of iridescent dark green (can appear jet-black to burnished green-yellow in some lights); on each side of shield several elongate erectile fan-shaped olive-brown pectoral plumes, these pinkish-buff immediately prior to a broad iridescent tip of metallic bright green; remaining underparts white; iris pale brown to dark brown or greyish-brown; bill ivory-yellow, mouth pale aqua-green; legs violaceous cobalt-blue to blue-grey. Female is similar in size to male, but tail (excluding central rectrices) longer; plumage radically different, in cryptically drab-coloured olive-brown above, with rusty margins on greater coverts, remiges and tail feathers, often with paler, buffier area above eye, variably buff on breast, flanks and lower belly, and entire underside finely and uniformly barred dark brown; bill and legs duller than adult male's. Newly fledged juvenile (11 days) has upper head brown, tinged russet, with light superciliary stripe with dark spot above, upperparts and tail grey-brown, wing feathers darker brown, greater coverts and outer primaries red-brown, chin grey-tinged brownish-yellow with fine streaks and points, underparts light grey with dark barring, iris grey-brown, bill-horn coloured, legs paler blue than female; immature male like adult, younger (darker-billed) individuals having much orange-rufous on wing-coverts and outer edges of flight-feathers, and orange-rufous wash on upper breast and (more so) to side of it, but steadily losing this as acquiring increasingly paler bill and then the red of adult plumage, rectrices pointed at tips; subadult male variable, like adult female with few feathers of adult male plumage intruding to like adult male with few feathers of female-like plumage remaining; with age, male acquires progressively shorter outer rectrices while simultaneously gaining progressively longer central pair. Race *coccineifrons* is very like nominate, differs only in having central pair of rectrices and bill slightly longer. Voice. Advertisment calls of males are varied, more typical ones being transcribed as a descending "whei-wher-wha" and ringing, falling, "wher-whei-wha"; a descending "queu-queu-queu"; a deep "kraaa-kraaa-kraaa"; a rising series of loud, throaty, "cho-chow-chaw-chaw-chaw-chaw-chai" notes; a nasal and plaintive series of "ca", "wa" or "wau" notes rising slightly in pitch; a lower-pitched, trilled, slowly delivered "rahn rahn rahn rahn"; a high, plaintive and nasal "ki-kyer"; a high insistent "ki kyer kyer kyer kyer kyer kyer kyer kyer kyer" rapidly delivered and dropping in pitch and speed toward the end. Some calls reminiscent of typical *Paradisaea*, whereas others like *C. magnificus*. A foraging call given by all birds is a plaintive "weeo-weeo" with each note downslurred and descending. During courtship adult males produce subdued chittering of rhythmic twittering, churring, buzzing and grating notes continuously.
Habitat. Lowland rainforest, monsoon forest, gallery forest and forest edge, including disturbed areas and tall secondary forest; from sea-level to 950 m, mainly no higher than 300–400 m.
Food and Feeding. Fruits and arthropods; no information on relative proportions of each. Forages at various levels of forest; joins mixed-species foraging flocks that may include *C. magnificus* and *Paradisaea* species.
Breeding. Breeds at least Mar–Oct, but probably in all months over range; two separate females with newly fledged young in May; males with much-enlarged gonads in Jan–Nov (mainly Apr–Oct), a female with enlarged oocytes in late Mar; display in Oct–Jan in SE of range (Port Moresby area). Polygynous, solitary to communal promiscuous males defoliating a traditional arboreal court; female builds and attends nest alone. Court in thick subcanopy vines of shaded forest interior; adult males dispersed predominantly in twos c. 45–90 m apart, but occasional group of four may gather to form lek; some males 150 m to more than 530 m apart, apparently forming mating system intermediate between non-territorial one and exploded lek; adult males vocalize persistently throughout day. Courtship involves a dance, and inverted and flight postures, with movements of wings, pectoral fans, relictual flank plumes and central rectrices, and gaping; display phases include Wing-cupping, Dancing, Tail Swinging, Horizontal Open Wings Display, an Inverted Phase of the Open Wings Display, and a Pendulum Display. One nest described, in Aru Is, in tree hole 2 m above ground, entrance c. 38 mm in diameter and cavity depth c. 46 cm, filled to within "a few inches" of entrance perch with palm fibres. Clutch 1–2 eggs; incubation in captivity (from first egg) 17 days, chicks left nest (possibly prematurely) at 14 days of age; female performed distraction display when almost fledged young examined by keeper.
Movements. Presumably resident.
Status and Conservation. Not globally threatened. CITES II. Locally fairly common; widespread, but patchily distributed. Calculated as representing c. 1% of avifauna at Soliabeda (near Purari R, at 610 m), in SE New Guinea. In 2002, within Crater Mountain Wildlife Management Area (E New Guinea), estimates at 432–650 m were 64·6 individuals/km² in primary forest, 31·9/km² in old gardens and 28·9/km² in new gardens, and figures at 651–935 m were 5·4 in primary forest, 27·2 in old gardens and 15·9 in new gardens; in forest near Port Moresby, estimated density of 6 individuals/10 ha. Total of 22 adult males located during eleven days in 100 ha of mature forest at Kakoro (SE range), but only nine in 150 ha of similar habitat during six days at Nomad R (in EC New Guinea).
Bibliography. Anon. (2000b), Beehler & Pruett-Jones (1983), Bell (1982a, 1982c, 1983), Berggy (1978), Bergman (1956, 1957b, 1968), Coates (1990), Cracraft (1992), Diamond (1972), Dupond (1937), Frith & Beehler (1998), Frith & Frith (1997b), Frost (1930), Gilliard (1969), Hoppmann & Magnus (2009), Marsden *et al.* (2006), McCarthy (2006), Mees (1964a, 1965, 1982), Ogilvie-Grant (1915), Rand (1938c).

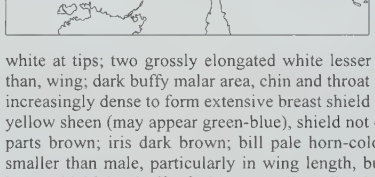
Genus *SEMIOPTERA* G. R. Gray, 1859

34. **Standardwing Bird-of-paradise**

Semioptera wallacii

French: Paradisier de Wallace **Spanish**: Ave-del-paraíso de Wallace
German: Bänderparadiesvogel
Other common names: (Wallace's) Standardwing

Taxonomy. *Paradisea* (*Semeioptera*) *Wallacei* [sic] G. R. Gray 1859, near Labuha Village, Bacan, off south-west Halmahera.
Birds on Kasiruta presumed to belong to nominate race, but confirmation needed. Original spellings of genus and species names were "*Semeioptera Wallacei*", but these spellings have both been formally rejected by ICZN and the current spellings formally protected. Two subspecies recognized.
Subspecies and Distribution.
S. w. halmaherae Salvadori, 1881 – Halmahera, in N Moluccas.
S. w. wallacii (G. R. Gray, 1859) – Kasiruta and Bacan, off SW Halmahera.



Descriptive notes. Male 26 cm, 152–174 g; female 23 cm, 126–143 g. Distinctive paradisaeid with short tail, and upper ridge of culmen sharply keeled. Male nominate race has conspicuous tuft atop upper mandible base and lores buff, grading into somewhat flattened crown of dully iridescent lavender-grey with lilac sheen, paler on side of face; mantle and back olive-brown to earth-brown, rump and uppertail-coverts mid-brown, uppertail greyish with whitish feather shafts, central pair of rectrices shortest; upperwing-coverts, tertials and secondaries mid-brown to greyish, alula and primary bases drab grey, fading to off-white at tips; two grossly elongated white lesser coverts form "standards" as long as, or longer than, wing; dark buffy malar area, chin and throat with iridescent bronzed yellow-green feathering increasingly dense to form extensive breast shield of iridescent emerald-green with bronzed green-yellow sheen (may appear green-blue), shield not clearly defined and not scale-like; rest of underparts brown; iris dark brown; bill pale horn-colour; legs yellow-orange. Female is on average smaller than male, particularly in wing length, but central tail longer; lacks wing standards and breast shield, has buff tuft above nostril smaller than in adult male, and crown has only slightest of discernible lilac sheen. Juvenile undescribed; immature male like adult female, but on average slightly longer tail; subadult male varies, from like adult female with few feathers of adult male plumage intruding to like adult male with few feathers of female-like plumage remaining, wing and tail length on average intermediate between those of adult and immature males; with age, male acquires progressively shorter tail, central feather pair decreasing considerably in length. Race *halmaherae* is similar to nominate, but crown and nape (sometimes also mantle) with pinkish coppery-purple iridescence, tail longer but other measurements fractionally smaller. Voice. Four distinctive vocalisations: advertisement call of 6–7 upslurred loud clear strident "wark" notes (sometimes a single note); aerial-display call of loud, raucous and nasal upslurred barks; musical chatter and twittering associated with high-intensity display; and, most common vocalization, a series of loud, upslurred, nasal "wark" notes by foraging adult males or by individuals moving about canopy away from lek, which would thus appear to be a contact call. Lekking males give variable harsh loud churring "waughh" notes, repeated several to many times, also a repeated clearer "wau-wau-wau..."; individuals click mandibles in unison at lek; some calls audible at c. 300 m or more. Distinctive wing-rustling in flight.
Habitat. Rainforests in lowland and hills, to at least 1000 m (mostly above 250 m) on Halmahera and to above 1150 m on Bacan; rarely, in mature secondary woodland. Best-known lek, on Halmahera, situated in tropical rainforest at ridge crest of range of low hills, on slight knoll on N-facing slope c. 50 m above and from a large, ephemerally flooded, boulder-strewn creek.
Food and Feeding. Fruits and arthropods; no data on relative proportions of each, but possibly more fruits. Nestling fed at least with fruits. Frequents dense foliage of lower canopy and subcanopy, foraging on fruits in groups of 3–4 individuals, including adult males; sometimes joins mixed-species foraging flocks.

Breeding. Breeds at least May–Sept; males with much-enlarged gonads in Apr–Oct and a female similarly in Sept; one nest with egg in early May and nestling 9th Jun (left nest in same month); display from early dry season (about Apr) to onset of wet season (about Dec). Polygynous, lekking promiscuous adult males on traditional display perches in a few adjacent trees; female builds and attends nest alone. Display perches thin, near-vertical branches or twigs, 25–30 m above ground in lower crown of tall forest canopy trees, removes foliage from perches; on Halmahera lek typically of 5–7 adult males, but up to 30–40 birds (including young males in female-like plumage) reported. Display involves limb-hopping, with static postures, and flight displays with movements of wings, pectoral shield and wing standards; phases include communal Convergence Display, in which one or several males charge along or about branches, and this may develop into Wing Pose, Wing Standard Display followed by Aerial Display (adult males), perched Static Display and copulation; perch displays like those of *Paradisaea*, but aerial display flight unique, involving vertical leap from extended legs, nearly vertical ascent flight with beating of fully open wings, at peak of flight wings held fully extended and bill turned downwards, then downward "float" while conspicuously white primaries rapidly vibrated. Only known nest an open cup, base of dried leaves, placed 10 m above ground between foliage of a large epiphytic orchid and trunk of palm immediately beneath its canopy; contained 1 egg. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Maluku EBA. CITES II. Generally common on both Halmahera and Bacan. On Halmahera, not located in remaining lowland forests around Sidangoli and N along coast to Gilolo and at foot of Mt Gamkanora, on W coast of N peninsula, and apparently rare in Tobelo area (on E coast); absent from apparently suitable coastal forest on E shores of E peninsula. On Bacan, recently found to be moderately common in primary and logged forest at 70–1150 m, but scarce in flat areas of logged forest close to Ra R. Systematic surveys in 1994 resulted in average of 0·2–0·3 birds/ha on limestone and non-calcareous sedimentary rock, but few on igneous rock and in montane areas. Similarly systematic surveys during 1994–1995 on Halmahera calculated average relative abundance in primary lowland forest as 0·4–0·8 birds/ha (higher number for volcanic substrate). In 1976–1978, forest remaining on Halmahera and Bacan estimated to be c. 19,000 km², of which less than 10% on limestone. Recent logging, agricultural expansion and clearance have resulted in almost complete destruction of lowland forests and considerable damage to hill forest, representing a serious threat to future survival of many animal species. Careful monitoring required.
Bibliography. Anon. (1990b, 1995), Bishop (1984, 1992b), Coates & Bishop (1997), Friedmann (1934), Frith (1992), Frith & Beehler (1998), Frith & Frith (1997b), Frith & Poulsen (1999), Goodfellow (1927), Graves (1995), Lambert (1994), LeCroy (1983, 1988), LeCroy & Bock (1989), McAlpine (1979), Mlikovský (1989), Poulsen & Lambert (2000), Steinheimer (2005), Stephan (1967), Wallace (1869).

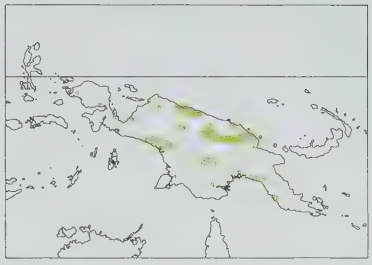
Genus *SELEUCIDIS* Lesson, 1835

35. **Twelve-wired Bird-of-paradise**

Seleucidis melanoleucus

French: Paradisier multifil **German**: Fadenparadieshopf **Spanish**: Ave-del-paraíso Filamentosa
Other common names: Twelve-wired Paradise Bird

Taxonomy. *Paradisea melanoleuca* Daudin, 1800, "Waigiou"; error = Salawati or the Vogelkop, New Guinea.
Intergeneric hybridization with *Ptiloris magnificus* and *Paradisaea minor* recorded. Two subspecies recognized.
Subspecies and Distribution.
S. m. melanoleucus (Daudin, 1800) – West Papuan Is (Salawati) and W & S New Guinea from Vogelkop E in N watershed to Mamberamo R and, in S watershed, to Port Moresby area and possibly to Milne Bay.
S. m. auripennis Schlüter, 1911 – N New Guinea from Mamberamo R to Ramu R.
Descriptive notes. Male 33 cm, 170–217 g; female 35 cm, 160–188 g. Male nominate race has entire head velvety black with iridescent coppery olive-green sheen, entire crown with purple iridescence; upperparts, including lesser upperwing-coverts, velvety black with iridescent oily sheen of coppery olive-green (washed purple in some lights); greater wing-coverts, alula, tertials, secondaries and uppertail iridescent violet-purple and/or magenta, primaries black; chin, throat and



entire breast velvety black with slight coppery yellowish-green iridescent sheen; large feathers bordering lower breast broadly tipped iridescent emerald-green, with violet-purple adjacent bases, forming gorget that extends up each side of breast; elongate and dense breast feathers form extensive breast "cushion"; remaining underparts, including grossly elongated, inwardly curving filamentous flank feathers, brilliant yellow; white central shaft of six flank plumes on each side grossly elongated beyond webs into black "wires" that, after recurving upwards, are again white; iris bright blood-red; black postocular stripe of bare skin; long, slightly decurved bill shiny black, mouth aqua-green; legs (including bare thighs) pink. Female is smaller than male, but with tail much longer; plumage radically different, cryptically drab-coloured, upper head and upper mantle sooty black with dull iridescent purple sheen, remaining mantle and entire upperparts chestnut-brown, paler on exposed primaries; malar area, throat and upper breast greyish-white, flecked, spotted and then uniformly barred blackish, as are remaining underparts; black postocular stripe of bare skin; bright pink tarsus. Juvenile undescribed; immature male like adult female (tail longer than adult male), also sometimes paler, washed with sandy orange-yellow and/or with brown base of lower mandible, iris pale brown, turning yellow with age; subadult male variable, from like adult female but with few feathers of adult male plumage intruding to like adult male with few remaining feathers of female-like plumage; with age, iris changes from yellow to almost red, and male progressively acquires grossly shorter tail. Race *auripennis* is smaller than nominate, notably in bill length, female underparts darker, more brownish, and more heavily barred than nominate. Voice. Male has two advertisement calls (accompanied by raising of open wings to expose yellow flanks): a throaty, nasal, resonant, mournful and downslurred "harnhr hahn" or "hahng"; and a series of 3–8 "hahr–haw haw haw" (note transcribed also as "ca'h", "wah", "wau", "wauk" or "oww"), first note highest-pitched and followed by brief pause, and final 2–7 in rapid succession. When a female visitor arrives, males give higher, insistent, whining, nasal "twang hahng-hahng-hahng-hahng-hahng", the notes falling in pitch, and a series of *Paradisaea*-like upslurred "koi-koi koi koi koi".
Habitat. Flat lowland rainforest, notably swamp-forest permanently or seasonally flooded and supporting pandanus (*Pandanus*) and sago palms (*Metroxylon*). Present up to 180 m.
Food and Feeding. Fruits, notably pandanus; also animals, mostly arthropods, but also small vertebrates (frogs, lizards); also flower nectar. Relative proportions of fruit and animals in diet estimated to be 50:50. Will forage acrobatically, hanging upside-down, to probe holes in tree branches. Joins mixed-species foraging flocks, including those with other birds-of-paradise and pitohuis (*Pitohui*).
Breeding. Breeds Jan to late Oct/early Nov in SE (near Port Moresby); males with enlarged gonads in Jan–Feb and Jun–Dec, peak gonadal activity Aug–Dec, females with enlarged oocytes Aug–Sept; display at least Jul–Jan. Polygynous, solitary adult male displaying at traditional perches; female builds and attends nest alone. Adult male frequents and vocally advertises one or several adjacent vertical, leafless and typically dead tree stumps protruding from forest canopy, three vocal males mapped at each of Nomad R and Kakoro (in E New Guinea) were at mean nearest-neighbour distance of 730 m; display perches, defended from other males, c. 0·5–1 km apart. Display involves perch dance, bill-fencing with female, postures involving movements of wings, flank plumes and wires, pectoral shield and thighs, and gaping, and a tactile phase (Wire-wipe Display) in which male swipes female across face with his flank wires. Nest a shallow egg-cup of (once supple) vine or tree inflorescence stems inside bulky deep structure of pandanus bark and vines on sparse foundation of sticks and leaves, lined with rootlets and plant fibres; built up to 14 m above ground in pandanus or sago palm. Clutch 1 egg, rarely 2; in captivity, incubation period 20 days, nestling left nest at 3 weeks of age.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. CITES II. Inadequately known, in part because of largely impenetrable habitat. Appears in general to vary from being locally uncommon to common; common on uplifted karst hill forest at 180 m in West Sepik Province (N New Guinea). In view of its extensive range and preferred habitat, this species is unlikely to be at any risk. Precise limits in SE of range uncertain, and species may occur E to Milne Bay if adequate coastal plains permit.
Bibliography. Beehler & Pruett-Jones (1983), Bergman (1957a, 1968), Coates (1990), Crandall (1937a, 1937b), D'Albertis (1880), David & Gosselin (2002b), Forbes (1882a), Frith & Beehler (1997, 1998), Frith & Frith (1997b), Gilliard (1950, 1955, 1969), Guillemard (1886), McCarthy (2006), Wallace (1869).


♂
36
♀
♀
37
♂
PLATE 27
inches 5
cm 13
ssp raggiana
38
♂
♀
ssp augustaevictoriae
♂
39
♀

Genus *PARADISAEA* Linnaeus, 1758

36. **Lesser Bird-of-paradise**

Paradisaea minor

French: Paradisier petit-émeraude **Spanish**: Ave-del-paraíso Esmeralda Chica
German: Kleiner Paradiesvogel
Other common names: Little Emerald Bird-of-paradise

Taxonomy. *Paradisea minor* Shaw, 1809, Dorey, Vogelkop, New Guinea.
Genus name sometimes spelt *Paradisea* (see page 46). Has been suggested to form a superspecies with *P. apoda*, *P. raggiana*, *P. decora* and *P. rubra*. Hybridization with *P. raggiana* and *P. guilielmi* and also, intergenerically, with *Ptiloris magnificus*, *Cicinnurus magnificus* and *Seleucidis melanoleucus* recorded. Proposed race *pulchra* (described from Misool, in West Papuan Is) synonymized with nominate. Three subspecies recognized.
Subspecies and Distribution.
P. m. minor Shaw, 1809 – West Papuan Is (Misool) and W New Guinea E in N watershed to West Papua–Papua New Guinea border and, in S watershed, to Etna Bay.
P. m. jobiensis Rothschild, 1897 – Yapen I, in Geelvink Bay (NW New Guinea).
P. m. finschi A. B. Meyer, 1885 – N New Guinea from just E of border E to Gogol and upper Ramu R.



Descriptive notes. 32 cm (excluding tail wires); male 183–300 g, female 141–210 g. Male nominate race has lores, forehead, ear-coverts, malar area, chin and throat finely feathered iridescent yellowish emerald-green, nostril covered by feathers; rest of head pale orangy yellow, glossed iridescent silver, this extending onto nape and mantle and blending into mid-brown of back and upperwing; remaining upperparts, including upperwing and tail, paler brown, washed maroon on back, rump and uppertail-coverts, wing with extensive orangy-yellow shoulder bar and outer edges of greater coverts; central pair of rectrices grossly elongated, only basally webbed and coloured as tail, distally reduced to fine brown wires; breast darker maroon-brown, becoming paler on belly, thighs and undertail-coverts, central tail-coverts soft, fluffy and much elongated; grossly elongated filamental flank plumes bright yellow at bases, streaked maroon, fading distally to dirty white and to slightest of beige hue; iris yellow; bill chalky bluish-grey, mouth pinkish-flesh; legs purplish grey-brown. Female is smaller than male, exclusively so in wing length, with central rectrices shorter, narrower and more pointed than rest; entire head dark brown, grading to paler buff on nape and mantle, remaining upperparts variably mid-brown to dark brown; dark brown throat, white rest of underparts with pinkish light brown wash, especially on flanks and undertail-coverts, thighs brown. Juvenile undescribed; immature male like adult female; subadult variable, like adult female with few feathers of adult male plumage intruding, and with central rectrices longer, narrower and more pointed than rest, to like adult male with few feathers of female-like plumage remaining; in captivity, transition from female-like to adult male plumage started at age 4 and continued for further 4–5 years, individual thus 8–9 years old when first in full adult male plumage; male acquires progressively longer central rectrices. Race *jobiensis* is larger than others, especially in tarsus length, has flank-plume colour same as nominate; *finschi* is on average similar in size to nominate, but flank plumes proportionately slightly shorter and of brighter orangy yellow; yellow shoulder less extensive than in other races. Voice. Advertisement song of lekking males is a series of high-pitched clear sharp "wak" notes (alternatively transcribed as "wok", "whi", "uwhi", "wha" or "waiy"), and "wik wong–wau wau", similar to songs of congeners; similar but more excited, higher-pitched and more quickly delivered convergence call usually started by a few softer introductory notes; calls show much variation in pitch, tone and speed between or within series of notes, especially by excited and counter-singing males.
Habitat. Lowland and hill forest, swamp-forest, forest edge and second growth; adaptable to human-altered environments. Sea-level to c. 1550 m. Adult and subadult males restricted to forest and advanced second growth, whereas birds in female-type plumage have broader habitat acceptance; upper altitudinal limit of adult and subadult males lower than that of female-plumaged birds. Leks reported from much-disturbed, secondary mid-mountain forest, and in a single lofty tree or two immediately adjacent trees in forest interior.
Food and Feeding. Mostly fruits, also arthropods. Forages mainly in canopy; also lower when seeking arthropods. May join mixed-species foraging flocks with other birds-of-paradise and flocks of New Guinea Babbler (*Pomatostomus isidorei*).
Breeding. Season at least Jul–Feb; males with enlarged gonads in most months, but more so Feb–Aug, and females with enlarged oocytes in Jul–Sept, Nov and Feb (mostly Aug). Polygynous, lekking promiscuous males at traditional tree perches; female builds and attends nest alone. Males defoliate lek area, up to twelve adult males in single lek tree, most copulations performed by centrally located individual male; traditional leks persist in one tree, or a few adjacent ones, for many years, possibly up to a century. Display occurs as males gather at a lek because one or more females nearby; courtship involves three fundamental display phases, i.e. Convergence Display, Static Display and Copulatory Sequence dance phase, with some additional postures and movements, the Convergence Display including upright Wing Pose (as for *P. apoda*). Two nests known, both a bulky open cup made from twigs, sticks, vines and dead leaves, lined with black wire-like fibres or rootlets, one placed 6 m above ground in branch fork of slender tree in forest near native garden, the other "very high" in thick foliage in a garden and fallow zone. Clutch 1–2 eggs, mostly 1; in captivity, incubation period 18 days, three single-nestling broods left nest 18 or 19 days after hatching.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. CITES II. Common and widespread. Very common in S Adelbert Mts in Mar–Apr 1959, and moderately common in forests from base to c. 1070 m on Cyclops Mts in Jul 1990; one of commonest birds on Yapen I, in lowland, hill and mountain forests, in Mar 1997. Despite generations of hunting of adult males by local people, this species appears not to have suffered any serious decline in its populations.

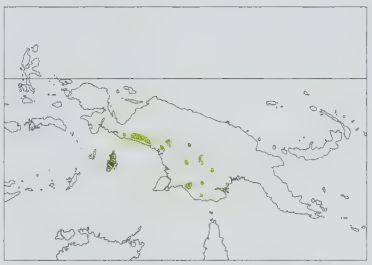
Bibliography. Aruah & Yaga (1992), Beehler (1983c), Coates (1990), Cooper (1995), David *et al.* (2009), Frith (1998), Frith & Beehler (1998), Frith & Frith (1997b), Gilliard (1969), Gilliard & LeCroy (1961), Gyldenstolpe (1955b), Healey (1978a), Hoogerwerf (1971), Hundgen *et al.* (1990), Laska *et al.* (1992), LeCroy (1981b), Majnep & Bulmer (1977), Mayr (1941), McCarthy (2006), Mees (1965), Menegaux (1913), Rand & Gilliard (1967).

37. **Greater Bird-of-paradise**

Paradisaea apoda

French: Paradisier grand-émeraude **Spanish**: Ave-del-paraíso Esmeralda Grande
German: Großer Paradiesvogel
Other common names: Great Bird-of-paradise

Taxonomy. *Paradisaea apoda* Linnaeus, 1758, India; error = Aru Islands, New Guinea.
Genus name sometimes spelt *Paradisea* (see page 46). Has been suggested to form a superspecies with *P. minor*, *P. raggiana*, *P. decora* and *P. rubra*. Hybridization with *P. raggiana* recorded; mixed leks including hybrid males found in S New Guinea. Race *novaeguineae* has been considered undiagnosable by some authors, who treat present species as monotypic. Two subspecies currently recognized.
Subspecies and Distribution.
P. a. novaeguineae D'Albertis & Salvadori, 1879 – mainland S New Guinea from Timika E to Fly/Strickland watershed.
P. a. apoda Linnaeus, 1758 – Aru Is.



Descriptive notes. Male 43 cm (excluding central tail wires); female 35 cm, 170–173 g. Male nominate race has lores, forehead, ear-coverts, malar area, chin and throat iridescent yellowish emerald-green, nostril covered by feathers; rest of head, including nape and hindneck, pale orangy yellow, glossed iridescent silver; entire upperparts, including upperwing and tail, maroon-brown, washed darker brown on mantle, back and lesser upperwing-coverts, slight orangy-yellow wash on outer edges of greater coverts; central rectrices grossly elongated, reduced to finely tapering blackish wires lacking webs except at bases, where same colour as tail; upper breast "cushion" blackish-brown, grading at lower border to dark brown and then to mid-brown on belly and medium pinkish-brown on thighs, vent and undertail-coverts; grossly elongated filamental flank plumes bright yellow at bases, streaked maroon, fading distally to dirty white; iris yellow; bill chalky pale bluish-grey; legs purplish grey-brown. Female is smaller than male, notably in wing length, with central rectrices shorter, narrower and more pointed than rest; entire head and upper breast dark brown, upperparts as on male but darker and lacking orangy-yellow wash, underparts similar to those of male. Juvenile undescribed; immature male like adult female; subadult male variable, like adult female with few feathers of adult male plumage intruding, initially about head, to like adult male with few feathers of female-like plumage remaining; males may take at least five or six years to acquire adult plumage, but study required; male progressively acquires longer central rectrices with age. Race *novaeguineae* differs from nominate in having paler upper breast, more maroon general coloration, and smaller size. Voice. Most common lek advertisement call by male a deep "wauk" or "wonk", delivered as 4–5 deliberate notes, first two equal in intensity and remainder increasingly louder and higher; also a more rapid series of "wauk" notes at one pitch, delivered in short bursts (each note usually accompanied by short wingbeats). Various calls during display phases: during Wing Pose a shrill sliding "eee-ak", usually repeated several times, but may be alternated with rapid "wauk"; series of rapidly repeated "wauk" notes of same pitch, delivered faster than above calls and, if given during Pump Display, notes often running together as "wa-wa-wa-wa"; at end of a Pump call, one or several drawn-out, harsh nasal "baa" notes given as male tips forwards and downwards; during Dance Display, male produces slow rhythmic "click", sometimes with faint nasal "bonk" as wings raised for a dance step; harsh, guttural "chug-ich", "chug-a" or "chug-a-la" may be given by male when bouncing along perch prior to "click" call, or when moving off from lek.
Habitat. Lowland forest and hill forest, to at least 950 m.
Food and Feeding. Few observations. Fruits and arthropods. Individuals in female-type plumage frequently in small groups, including with *Manucodia ater* and other avian frugivores; adult males away from lek typically solitary. Dietary preferences and foraging behaviour probably much as for *P. raggiana*.
Breeding. Breeding at least Mar, May and Aug–Dec; display at least Oct at Kiunga (in E of range). Polygynous, lekking promiscuous males on traditional tree display perches; female builds and attends nest alone. Lek consists of larger exposed horizontal boughs of large spreading tree(s), immediately beneath canopy, contains up to at least 15 adult males, which defoliate immediate area of display perches; leks traditional, persisting for many years in same tree or trees; some leks may be shared with male *P. raggiana*. Lekking males display both in absence of females and as latter approach or arrive at lek; three basic display phases are Convergence Display, involving upright Wing Pose and Pump (charging) Display, and Static Display with a Bow, and Copulatory Sequence involving dance phase that usually (but not always) follows Wing Pose–Pump–Bow sequence. One nest described, an open shallow basin-shaped structure 21 cm in total diameter, base of large leaves, and bowl of epiphytic orchid or vine stems and with some *Pyrrosia*-like fern fronds, egg-cup lining of long fine vine tendrils, built in large tree-branch fork. Clutch 1 egg; in captivity, artificial incubation 16–17 days, hatching 12–46 hours, chicks left nest at 18–20 days, start of independent feeding at 29–32 days.
Movements. Presumably resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in South Papuan Lowlands EBA. CITES II. Common and fairly widespread; probably commonest in lower foothills. In E of range, common in rolling lowland forest at c. 30 m to W & N of Kiunga; around Ok Tedi, recently declined conspicuously where hunting with shotguns occurred while remaining common where firearms not available. During extensive survey of Aru Is avifauna, this species was notably more abundant in N than in S, being moderately common Mar–Apr 1988; no males in adult plumage observed, however, these being regularly hunted for plume trade. Otherwise, although adult males heavily culled throughout range during height of plume trade, no serious adverse long-term impact apparent.

On following page: 38. Raggiana Bird-of-paradise (*Paradisaea raggiana*); 39. Goldie's Bird-of-paradise (*Paradisaea decora*).

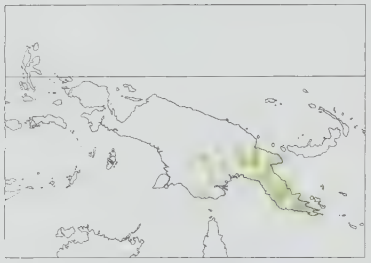
Bibliography. Berlepsch (1911), Coates (1990), Cracraft (1992), David *et al.* (2009), Dinsmore (1969, 1970a, 1970b), Elliot (1873), Frith (2003), Frith & Beehler (1998), Frith & Frith (1997b), Goodfellow (1910), Iredale (1950), Jensen (2007), LeCroy (1981b), Mayr (1931c), McCarthy (2006), Wallace (1858, 1869).

38. Raggiana Bird-of-paradise

Paradisaea raggiana

French: Paradisier de Raggi **German**: Raggiparadiesvogel **Spanish**: Ave-del-paraíso de Raggi
Other common names: Raggi's/Count Raggi's/Red-plumed Bird-of-paradise

Taxonomy. *Paradisea raggiana* P. L. Sclater, 1873, Orangerie Bay, extreme south-east New Guinea. Genus name sometimes spelt *Paradisea* (see page 46). Has been suggested to form a superspecies with *P. minor*, *P. apoda*, *P. decora* and *P. rubra*. Hybridization with *P. minor*, *P. apoda*, *P. guilielmi* and *P. rudolphi* recorded. Race *salvadorii* sometimes treated as synonym of nominate. Additional proposed race *granti* (described from area inland from Huon Gulf) sometimes recognized, but probably better considered a linking population between *intermedia* and *augustaevictoriae*; two last-mentioned races hybridize in region of lower Mambare R. Four subspecies recognized.
Subspecies and Distribution.
P. r. salvadorii Mayr & Rand, 1935 – S & SE New Guinea from Fly/Strickland watershed E (extending into interior highland valleys, e.g. Wahgi and Tari Valleys) to Cloudy Bay.
P. r. augustaevictoriae Cabanis, 1888 – upper Ramu R and Huon Peninsula (and interior valleys to S, i.e. those of Markham, Wafa, Watut and Bulolo rivers), and also SE to Waria R watershed and coastally to lower Mambare R.
P. r. intermedia De Vis, 1894 – N coast of SE New Guinea from lower Mambare R E to Collingwood Bay.
P. r. raggiana P. L. Sclater, 1873 – S watershed of SE New Guinea from Cloudy Bay E to Milne Bay, and into N watershed as far as Goodenough Bay or Cape Vogel.



Descriptive notes. Male 34 cm (excluding tail wires), 234–300 g; female 33 cm, 133–220 g. Male nominate race has lores, forehead, ear-coverts, malar area, chin and throat iridescent yellowish emerald-green, nostril covered by feathers; rest of head, including nape and hindneck, pale orangy yellow, glossed iridescent silver, yellow extending as narrow collar across lower throat and also from hindneck onto mantle (there overlying dark brown, producing apparent mid-brown colour); remaining upperparts, including upperwing and tail, dark brown, washed maroon on back, rump and uppertail-coverts, with discrete pale orangy-yellow wingbar on lesser coverts and variable orangy-yellow wash on outer edges of greater coverts; central pair of rectrices grossly elongated, reduced to finely tapering blackish wires and lacking vanes except at bases; upper breast blackish-brown with iridescence of dark coppery-bronze, grading to medium brown on belly and to pinkish mid-brown on thighs, vent and undertail-coverts, the last softly filamental and elongated to half tail length; grossly elongated and tapering filamental flank plumes crimson to orange-crimson with buffish-white tips on lower surface and rusty-brown on upper surface; iris yellow; bill pale chalky bluish-grey, mouth pinkish-flesh; legs pale, dull fleshy brown. Female is smaller than male, notably in wing length and weight, and with central rectrices shorter, narrower and more pointed than rest; face, ear-coverts, chin and throat dark brown, crown, rear and side of neck and narrow foreneck-collar dark buff-yellow, collar quickly grading to pinkish light-brown on underparts, which paler on central belly. Juvenile is entirely dark brownish, but by four months of age like adult female; immature male as adult female; subadult male variable, like adult female with few feathers of adult male plumage intruding, initially about head, to like adult male with few feathers of female-like plumage remaining; male gains progressively longer central pair of rectrices; in captivity, first traces of adult male plumage acquired at c. 5 years, full plumage after at least a further year or two, two nestlings took three years to acquire completely yellow iris. Race *salvadorii* is like nominate, but brown mantle of both sexes lacking yellow, and scarlet of male flank plumes paler and plumes shorter; *intermedia* is similar to previous, but both sexes with yellow mantle–back and yellow streaking down to uppertail-coverts; *augustaevictoriae* is like last, but flank plumes apricot-orange, abdomen paler, and yellow throat-collar narrow, female much paler above and below than nominate female, with more buff-yellow on back, and yellowish collar on foreneck reduced or absent. Voice. Advertisement call of lekking males a series of loud far-carrying cries, increasing in intensity and sometimes in pitch, "wau wau wau wau wau wáú wááúú wááúú wáááúúú", end notes longest and coarsest, given at or away from leks; high-pitched call a more rapid, raspy "wok wok wok wak wak waagh waagh"; considerable variation in both these calls. Display call a long series of high-pitched, excited, insistent notes, given by male from lek perch and typically in presence of conspecifics during lek convergence; one or several males give display calls while vigorously performing charging displays.
Habitat. Lowland forest, hill forest and lower montane forest, secondary growth, forest edges, gardens, and casuarina (*Casuarina*) trees and copses in open deforested areas; adult males mostly remain in forest interiors; sea-level to c. 1500 m. Leks may be formed in almost any habitat type; traditional lek sites tend to occupy prominent position in local topography, such as high ridge crest, but also found in valleys or at sites lacking prominent relief.
Food and Feeding. Mostly fruits, mainly capsular ones and figs (*Ficus*); also arthropods. Nestlings fed with arthropods for first five days, thereafter with both fruits and arthropods. Frequents middle stage to canopy of forest. Gleans arthropods from bark, branches and canopy leaves. Joins other passerines in mixed foraging flocks, including those with New Guinea Babblers (*Pomatostomus isidorei*) and various pitohuis (*Pitohui*), sometimes with one or more other birds-of-paradise.
Breeding. Season at least Apr–Dec; nesting recorded Oct–Nov in Wau and late Jul and Aug at Varirata (near Port Moresby); males with gonads moderately enlarged in all months except Nov (sample lacking) but much enlarged only Apr–Oct and one in Jan; display months vary across range, peak Jun–Oct in Wau Valley and May–Aug at Varirata National Park, activity at each extending for at least a month before and after peak. Polygynous, lekking promiscuous males on traditional display perches; female builds and attends nest alone. Leks typically located in upper portion or top branches of a canopy tree in forest interior or forest remnant, most involving a single tree canopy but some can include another, and may hold several to as many as ten adult males; leks commonly long-lived, to more than 20 years; some leks may be shared with male *P. apoda*. Courtship involves three fundamental display phases, i.e. Convergence Display, Static Display and Copulatory Sequence dance phase, with small differences in detail of posturing, movements and feather presentation. Nest an open bowl-shaped structure of leaves, leaf pieces, rootlets, vine stems, orchids or ferns and fibres, with discrete egg-cup lining of horsehair-like material, built in tree branches 2–11 m above ground (higher in human-disturbed areas). Clutch 1–2 eggs, mostly 2, eggs laid on consecutive days in captivity; incubation period at one nest in wild 18 days, at one in captivity 20 days; nestling period in captivity (three nests) 17–20 days. Long-lived in captivity: 13-year-old female fertilized by a male c. 33 years old, and successfully raised two offspring.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. CITES II. Common, and widespread. In 2002, within Crater Mountain Wildlife Management Area (E New Guinea), estimates at 432–650 m were 16·3 individuals/km² in primary forest, 14·7/km² in old gardens and 20·9/km² in new gardens, and figures at 651–935 m were 42·7 in primary forest, 70·3 in old gardens and 70·8 in new gardens. In 1970s/80s, Brown R forest (Port Moresby) estimated to support 1 bird/ha, and in 200 ha on Mt Missim ten adult males were resident and formed two leks. No evidence of any significant potential threat.
Bibliography. Anon. (1998a), Beehler (1983a, 1983b, 1988), Beehler & Dumbacher (1996), Beehler & Pruett-Jones (1983), Bell, H.L. (1982a, 1983, 1984a), Cracraft (1992), Crandall (1931, 1932), David *et al.* (2009), Davis & Beehler (1994), Dharmakumarsinhji (1943), Diamond (1972), Forshaw & Cooper (1977), Frith (1981), Frith & Beehler (1998), Frith & Frith (1997b), Gilliard (1950, 1969), Goodfellow (1908), LeCroy (1981b), Mackay (1981), Marsden *et al.* (2006), Mayr & Gilliard (1954), McCarthy (2006), Muller (1974), Rimlinger (1984), Schodde (1976), Searle (1980), Stresemann (1924), Wahlberg (1992), Watson *et al.* (1962).

39. Goldie's Bird-of-paradise

Paradisaea decora

French: Paradisier de Goldie **Spanish**: Ave-del-paraíso de Goldie
German: Lavendelparadiesvogel

Taxonomy. *Paradisea decora* Salvin and Godman, 1883, Fergusson Island, New Guinea.
Genus name sometimes spelt *Paradisea* (see page 46). Has been suggested to form a superspecies with *P. minor*, *P. apoda*, *P. raggiana*, and *P. rubra*. Monotypic.
Distribution. D'Entrecasteaux Archipelago (Fergusson I, Normanby I), off SE New Guinea.



Descriptive notes. Male 33 cm (excluding tail wires), one 237 g; female 29 cm. Male has lores, lower forehead, malar area, chin and throat covered with fine iridescent plush yellowish-green to dark green feathering; crown and mantle to uppertail-coverts orange-yellow, richer on crown, iridescing white in some lights; upperwing-coverts pale orange-yellow, alula, flight-feathers and tertials pinkish, washed olive-brown, with yellow outer edges; uppertail similar to wing but darker, greatly elongated central rectrices reduced to fine wire-like shafts except at bases, where narrow tapering webs blackish with dark green iridescence; breast medium-grey with lavender suffusion, separated from iridescent green throat by narrow greyish-yellow collar, fading beneath lower breast to more pinkish-beige on vent, thighs and undertail-coverts; greatly elongated flank plumes silky crimson with white filamental tips ventrally, and rusty-brown with paler tips dorsally; thighs concealed by innermost flank plumes short, inwardly curving, and black with violet suffusion and iridescent gloss; iris sulphur-yellow; bill chalky blue-grey, interior mouth grey; legs purplish brown-grey. Female is considerably smaller (exclusively so in wing length) than male, except in bill length; forehead, lores, malar area, chin and throat dark brown, crown to upper mantle yellowish-buff, grading to brownish-olive on rest of upperparts; underparts cinnamon, darker on breast, and finely barred greyish throughout. Juvenile undescribed; immature male like adult female; subadult male variable, like adult female with few feathers of adult male plumage intruding, initially about head, central rectrices pointed and longer than rest, to like adult male with few feathers of female-like plumage remaining and central tail wires retaining some terminal webs as elongate spatulate tips; male gains progressively longer central rectrices with age. Voice. Advertisement calls of lekking male include "wok-wok" or "wark", usually given in absence of females; also soft "whick-whick" in absence of females, possibly as male-to-male contact, but a loud, liquid, ringing version of this given also when female on lek. Relatively soft "wuk wuk whik-whik-whik-whik" and explosively loud, clear, sharp, somewhat *Epimachus*-like "whit whit whit" call also known. Low growling call by male starting to display to a female; two males displaying simultaneously, often in presence of a female, may duet with loud, ringing metallic "waak" notes given alternately, these notes becoming increasingly rapid to produce continuous metallic rattling gurgle.
Habitat. Hill forest and forest edge, secondary regrowth, and fallow upland gardens; up to at least 600 m. A lek on SW Fergusson I was on steep S-facing slope, just below a ridge crest, at 400 m in mature rainforest with fairly even canopy c. 30–33 m high.
Food and Feeding. Little known. Fruits and arthropods. Forages both in trees and on ground.
Breeding. No data on season; one male in Sept and four in Dec had much-enlarged gonads; displays and matings observed second week of Nov. Polygynous, lekking promiscuous adult males on traditional display perches; female builds and attends nest alone. A lek in SW part of Fergusson I consisted of four main trees with display limbs at 20–23 m in middle canopy, nearer the trunk; c. 8–10 adult males attended this lek, usually two birds to each tree, and no more than two females and six unplumed males seen at any one time; males regularly defoliate display limbs. Courtship involves three fundamental display phases, i.e. Convergence Display, Static Display and Copulatory Sequence dance phase with additional postures and movements. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in D'Entrecasteaux and Trobriand Islands EBA. CITES II. Poorly known. Fairly common within tiny global range. Total population likely to be rather small, and probably declining as a result of habitat degradation. On other hand, this species seems to be tolerant of some small-scale logging. No imminent plans for large-scale logging on Fergusson and Normanby, but both islands have been targeted by multi-national logging companies; in addition, a proposal has been made to convert large areas of Normanby to cash crops. Contemporary assessments of this species' populations and habitats, and potential threats facing it, are needed.
Bibliography. Anon. (2008j), Butchart & Stattersfield (2004), David *et al.* (2009), Frith & Beehler (1998), Frith & Frith (1997b), Gilliard (1969), LeCroy (1981b), LeCroy, Kulupi & Peckover (1980), LeCroy, Peckover *et al.* (1984), Stattersfield & Capper (2000).

PLATE 28 ➤



PLATE 28

inches 4
cm 10

40. **Red Bird-of-paradise**

Paradisaea rubra

French: Paradisier rouge **German**: Rotparadiesvogel **Spanish**: Ave-del-paraíso Roja

Taxonomy. *Paradisea rubra* Daudin, 1800, Waigeo, West Papuan Islands, New Guinea.
Genus name sometimes spelt *Paradisea* (see page 46). Has been suggested to form a superspecies with *P. minor*, *P. apoda*, *P. raggiana* and *P. decora*. Monotypic.
Distribution. West Papuan Is (Waigeo, Gemien, Saonek and Batanta; presumably also Gam), off NW New Guinea.



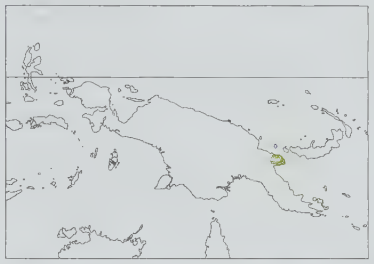
Descriptive notes. Male 33 cm (excluding tail wires), 158–224 g; female 30 cm, 115–208 g. Male has head to just behind eye, ear-coverts, chin and extensive throat area of finely scaled iridescent dark emerald-green feathering, feathers above each eye slightly elongated and curved to form erectile cushion-like structure; remainder of head, and nape, upper and central mantle and modified (mantle-like) upperwing-coverts pale orange-yellow, side and lower centre of mantle amber, washed yellow, with iridescent white sheen, grading to russet-brown on back; rump and uppertail-coverts pale orange-yellow, washed amber; upperwing, including alula and primary coverts, and uppertail reddish-brown; central pair of rectrices uniquely modified into grossly elongated, gently twisting, concave shiny black "tapes" 3–4 mm wide of plastic-like appearance and texture; somewhat stiff pale orange-yellow upper breast feathers, elongated and pointed to lower side, form small breast shield, and plumage beneath this glossy dark brown, washed maroon, becoming paler and less maroon on belly and grading to hazel on vent, thighs and undertail-coverts; elongate, slightly stiffened and downward-curving flank plumes carmine to crimson and variably dark brown to medium-brown on upper surface, with off-white filamental tips; iris dark reddish-brown; bill yellow, washed pale green; legs bluish-grey to grey-brown. Female is slightly smaller and clearly lighter than male, with central pair of rectrices narrower and more pointed than the rest; face (to posterior eye) and throat dark brown, rear crown, neck and nape buff-yellow, grading into dark brown on upperparts; upper breast with discrete broad glossy straw-yellow bar, remaining underparts brownish. Juvenile undescribed in wild, in captive-bred young yellow upper breast began to appear at 60 days and by 125 days was distinct and resembled that of adult female; immature like adult female, but on average larger; subadult male variable, like adult female with few feathers of adult male plumage intruding to like adult male with few female-type feathers remaining, central pair of tail feathers initially simply longer, narrower and more pointed than rest, to relatively short bare central shaft wire with elongate spatulate tip that becomes progressively longer and with smaller-webbed tips, male taking 5–6 years to acquire full adult plumage; male acquires progressively longer central pair of rectrices with age. VOICE. Most common advertisement call by lekking male a loud, clear repeated "wak", the bird building up to this with throaty "work – wok, wak, wak, wak, wak, wak", which then becomes loud "wok–wau-wau-wau". Other calls include similar but higher-pitched "ca–ca–ca–ca–ca–ca"; an oft-given corvid-like coarse, guttural "kaw, kaw, kaw"; also common is a soft pathetic-sounding "weep", and not uncommon are a soft high-pitched "meew" and a single snap of the mandibles, also a ticking sound that may be preceded by high-pitched "beep" and ended with low guttural "book", thus "beep t-t-t-t-t book".
Habitat. Lowland rainforest and hill forest, from sea-level to c. 600 m.
Food and Feeding. Little known. Fruits and arthropods recorded. In captivity, a female fed her single hatchling exclusively with regurgitated soft fruits for five days, then with animal food, when she continued to eat fruits herself but fed young only with cockroaches (Blattodea), crickets (Orthoptera), mealworms (*Tenebrio*) and pieces of new-born mice (Muridae); when offspring just over a month old, she started again to feed it with fruits, in addition to animal items.
Breeding. Females with enlarged oocytes indicative of breeding in Sept–Oct; display at least Jul and Sept. Polygynous, lekking promiscuous males on traditional display perches; female builds and attends nest alone. On Waigeo, lek in one gigantic tree in small forest clearing attended by up to ten adult males, which called and displayed on high defoliated limbs, usually after dawn (males most vocal early mornings and late afternoons). Courtship involves three fundamental display phases, Convergence Display, Static Display and Copulatory Sequence dance phase, with some additional postures and movements. No information of nest-site and nest in wild. In captivity, clutch 1–2 eggs, laid on consecutive or alternate days, incubation 14–17 days, nestling period 15–20 days.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in West Papuan Lowlands EBA. CITES II. Common in suitable habitats. Has very small global range, in which moderately small population likely to have declined as a result of habitat loss. On Waigeo, selective logging reported in N of island, SE corner suffered extensive fire damage in 1982, and concerns expressed over cobalt-mining concession on the island. On Batanta (where only 100 km² protected), logging has resulted in major habitat loss, but degree to which this species is tolerant of logged forest poorly known. It is hunted locally for skins and possibly for the cagebird trade. Extent of viable habitat and of collecting for bird trade require monitoring.
Bibliography. Anon. (2008j), Butchart & Stattersfield (2004), Collar *et al.* (2001), Crandall (1937a), David *et al.* (2009), Frith (1976), Frith & Beehler (1998), Frith & Frith (1997b), Gyldenstolpe (1955b), Heads (2002), Hundgen *et al.* (1991), Isenberg (1961, 1962), LeCroy (1981b), Stattersfield & Capper (2000), Todd & Berry (1980), Wallace (1869), Wilkinson *et al.* (2004), Worth *et al.* (1991).

41. **Emperor Bird-of-paradise**

Paradisaea guilielmi

French: Paradisier de Guillaume **Spanish**: Ave-del-paraíso Imperial
German: Kaiserparadiesvogel
Other common names: Emperor of Germany/White-plumed Bird-of-paradise

Taxonomy. *Paradisea Guilielmi* Cabanis, 1888, Kaiser Wilhelm's Land = Sattelberg, south-east Huon Peninsula, New Guinea.
Genus name sometimes spelt *Paradisea* (see page 46). Hybridization with *P. minor* and *P. raggiana* recorded. Monotypic.
Distribution. Huon Peninsula (Finisterre Range, Saruwaged Range, Cromwell Mts, Rawlinson Mts), in NE New Guinea.



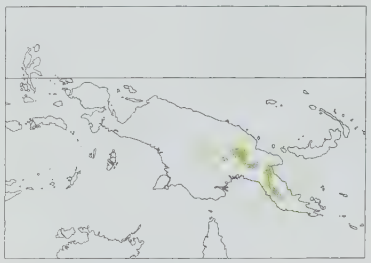
Descriptive notes. Male 33 cm (excluding tail wires), 250–265 g; female 31 cm. Male has most of head and upper breast iridescent oily brilliant dark green or greenish-yellow, rear crown to neck and mantle pale straw-yellow with maroon feather bases; lower back, rump, uppertail, upperwing-coverts and tertials dark brown with maroon wash, remainder of upperwing and tail dark brown, central pair of tail feathers grossly elongated, only basally webbed, distally reduced to fine brown wires; yellow cowl extends down to lower side of green breast; lower breast dark maroon, belly dark dusky brown, vent, thighs and undertail-coverts dark brown, washed maroon; grossly elongated, fine, sparse filamental flank plumes ventrally and basally pale orangy yellow, elsewhere white, also a patch of elongate white feathers on each side of belly (impression of flank plumes expanding across underparts, almost meeting centrally); iris dark reddish-brown; bill chalky bluish-grey with pale tip, mouth (inside mandibles) chalky blue to pale aqua-blue; legs dull flesh-brown to brownish-pink. Female is smaller than male (exclusively so in wing length), lacks iridescent colours and elongated plumes; head and breast dark brown, and yellow on upperparts and side of breast duller; remaining upperparts dark brown, paler than on adult male, lower breast and belly mid-brown. Juvenile undescribed; immature male like adult female; subadult male variable, like adult female with few feathers of adult male plumage intruding to like adult male with few feathers of female-like plumage remaining; male acquires progressively longer central pair of rectrices, with slightly shorter outer ones, with age. VOICE. Loud advertisement calls of lekking males include a series of 6–8 notes, first shorter and lower in pitch, remainder a repeated high-pitched "whu, whow, whow, whow, whow, whow", and a series of 5 identical upslurred nasal "whai" notes of almost metallic quality. Lekking males also give "pop", "baupop" and "bau" notes repeated up to five times, the last sometimes followed by a "pop bau" call; the "pop pop" can be extremely loud, unlike soft introductory "poop" or "pop bau" calls, and when delivered rapidly said to sound like exploding firecrackers. Other calls include nasal, upward-inflected "whaaiy" or "whi", singly or in series, reminiscent of call of *P. raggiana*; and variable, quiet, nasal, conversational "whoh", "hah", "whaw", "oh" or "ow", singly or repeated several times at intervals of a few seconds. Distinctive preliminary display call, often preceded by loud rising liquid "whick, whop, whop, whop, whop", is a fairly rapid series of 4 or 5 downward-inflected bubbling notes, "whop-whop-whop…" or "whoc-whoc-whoc…"; variations by excited males include "whick", "whop", "whop" and "whick-whick, whop".
Habitat. Primary hill forest, including pockets of forest isolated by gardens and other disturbance; c. 450–1500 m, mainly 670–1350 m.
Food and Feeding. Little studied. Mostly fruits, with some arthropods. Undertakes much scansorial searching on trees, gleaning insects from bark. Forages singly or, particularly in case of adult males, in twos or in groups; forages in fruiting trees with other birds-of-paradise.
Breeding. Breeds at least Sept–Dec; male with gonads enlarged in Oct and much enlarged Nov–Dec; display months variable across range, in SE (Sattelberg) most frequent in late Jan to early Mar and less so Apr–May, in SW (Boana area) Jul–Aug. Polygynous, lekking promiscuous adult males on traditional display perches; female builds and attends nest alone. Leks consists of up to six adult males congregating in one or two adjacent trees within sight of each other, several males displaying synchronously in a tree; at one lek activity most intense from c. 15:15 hours, individuals displaying as low as 3–6 m above ground. Two fundamental display phases of Convergence Display and Static Display recorded, and in general lek behaviour similar to that of congeners (but Copulatory Sequence not yet observed); most striking departure from *P. apoda* is that, in Static Display, male may perch still and silently upright for a few moments, or suddenly call loudly, before turning under perch to hang upside-down with flank plumes expanded (forming white disc with two central yellow patches), wings and tail partly spread, and head turned upwards, and constantly rocking slowly while twisting from side to side (using legs as a fulcrum); a female may perch directly above inverted male to look down at him as he looks up at her. One nest (collected Sept), built on firm foundation of large broad leaves, was constructed mostly from creeper tendrils and vines, with egg-cup lining of fine tendrils; site not described. Clutch 1–2 eggs. No other information.
Movements. No information.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Adelbert and Huon Ranges EBA. CITES II. Fairly common, and reasonably widespread. Has small range and probably moderately small population, which thought probably to be undergoing fairly rapid decline. Forest habitat within its range is under threat from commercial logging, as well as from clearance for cultivation for rapidly increasing human population. Forest degradation appears to bring this species into contact with *P. raggiana*, a competitively dominant congener which eventually replaces it; such habitat degradation around Boana village resulted in a major decline of present species, coinciding with increase in *P. raggiana*. Although its plumes are still sought by local people and traders, this exploitation is evidently on only a small scale. In view of this species' restricted range, intensive survey of its distribution, population, habitat and foraging ecology, integrated with assessment of potential threats, is required. Any increase in habitat loss could result in its becoming globally threatened.
Bibliography. Anon. (2008j), Butchart & Stattersfield (2004), David *et al.* (2009), Coates (1990), Crandall (1932), Dratfan (1978), Frith (1971), Frith & Beehler (1998), Frith & Frith (1997b), Gilliard (1969), Heads (2002), LeCroy (1981b), Mayr (1931c), McCarthy (2006), Menegaux (1913), Ripley (1950), Stattersfield & Capper (2000), Stresemann (1924), Wagner (1938).

42. **Blue Bird-of-paradise**

Paradisaea rudolphi

French: Paradisier bleu **German**: Blauparadiesvogel **Spanish**: Ave-del-paraíso Azul
Other common names: Prince Rudolph's/Archduke Rudolph's Blue Bird-of-paradise

Taxonomy. *Paradisornis Rudolphi* Finsch and A. B. Meyer, 1885, Hufeisengebirge [Horseshoe Mountains = Mount Maguli], south-eastern New Guinea.
Genus name sometimes spelt *Paradisea* (see page 46). Hybridization with *P. lawesii* and *P. raggiana* recorded. Proposed race *ampla* (described from Mt Missim, in SE New Guinea) synonymized with nominate. Two subspecies recognized.
Subspecies and Distribution.
P. r. margaritae Mayr & Gilliard, 1951 – EC New Guinea (Tari area, Enga Highlands, Sepik–Wahgi Divide, Kubor Range, Mt Giluwe, Mt Hagen, Mt Karimui, Bismarck Range).
P. r. rudolphi (Finsch & A. B. Meyer, 1885) – SE New Guinea from Eastern Highlands (Okapa) and Herzog Mts SE to Owen Stanley Range.



Descriptive notes. Male 30 cm (excluding tail wires), 158–189 g; female 30 cm, 124–166 g. Male nominate race has head, neck and mantle glossy jet-black with iridescent bronzed-green sheen, rear crown and nape suffused with dark carmine-red; crescents of silver-white feathers forming broken eyering; back and rump blackish with iridescent blue-green (upper back), blue and indigo-blue sheens, uppertail-coverts dark cobalt-blue; upperwing variably blue on coverts and inner wing to purplish-blue on tertials, leading edges darker, flight-feathers matt blackish with blue outer edges on all except outer three primaries; uppertail purple-blue, central feather pair grossly elongated into "ribbons" of narrow matt bluish-black webs, paler spatulate tips showing iridescent blue; upper breast matt-blackish with slightest of dark blue iridescence, more pronounced sheen on lower breast, to jet-black belly and dark brownish-black thighs and undertail-coverts; grossly elongated fine, sparse filamental flank plumes basally dark purple-blue with violet sheen, becoming blue centrally and variably purplish-blue to mauve distally; upper surface of flank plumes rusty amber, two areas of inner flank plumes forming a black and a dark crimson linear patch on each side of belly, these meeting during display to form continuous bicoloured line; iris dark brown; bill palest chalky bluish-white, almost white, mouth greenish-yellow; legs purplish-grey. Female is smaller than male, lacks elongated feathers; head and upperparts similar to male, but black areas duller, more dark brownish-black, with only faintest iridescence and no carmine or magenta on head; chestnut-brown below, grading from blackish on throat to dark cinnamon on underparts, with slight matt blackish barring but less so on central belly (and absent in some populations); younger female has more extensive, blacker ventral barring and dark bill. Juvenile is like adult female, but wings darker, bill dark greyish, abdomen whitish, and white feathers around eyes fully developed; immature male like adult female; subadult male like adult female but with few feathers of adult male plumage intruding, grading to like adult male but with few feathers of female-like plumage remaining; with age, male acquires shorter outer rectrices while simultaneously gaining progressively longer and narrower central pair. Race *margaritae* is like nominate, but female underparts uniformly narrowly barred blackish, and tail (excluding central feather pair) and tarsus on average shorter. Voice. Advertisment call of male "kwank", reminisent of that of *P. raggiana* but lower-pitched and more bell-like; also a high-pitched, bell-like upslur followed by repeated hard downslurs, "kouwi–carr-carrr-carr-carr…", and slowly cadenced plaintive series of downslurred notes, "wahr, wahr, wahr, wahr, wahr, wahr", more nasal and higher-pitched than *P. raggiana* calls; also descending "we wah wah wah wah wah weh weh weh" series, each note upslurred, repeated loud, nasal "quoi", a series of several upslurred high-pitched notes on one scale, "waah-wah-wha-wha-wha-wha-wha", and single "quaa" or "kwaa" notes. Ventriloquial display call, given by inverted male alone or to female visitors, is rhythmical mixture of low nasal chitterings and chatterings interspersed with low "caw" notes (and often a strange vibrating twanging note) that becomes a fast rhythmic buzzing (sounding like electric motor); if a female moves away from male, this sound replaced with urgent chittering and chatterings.

Habitat. Lower montane forest, forest edge, and denser older secondary growth of fallow gardens; 1100–2000 m, mainly 1400–1800 m. Adult males tend to inhabit centre of elevational range, with young males at upper and lower zones.

Food and Feeding. Mostly fruits, especially figs (*Ficus*), drupes, berries; also some animals, mostly arthropods, possibly lizards. Forages in high canopy when seeking fruits; also often lower in forest when searching for arthropods, which obtained by bark-gleaning. Adult males usually alone, but sometimes in fruiting canopy with individuals in female-type plumage and other species of bird-of-paradise. Females will defend a food resource (fruits).

Breeding. Across species' range breeding can occur at any time of year, mostly Jul–Feb; egg-laying Apr, nestling Nov–Dec, and newly fledged chick with scolding parent mid-Dec; display in NW of range (near Kompiam) mostly Apr to late Nov. Polygynous, solitary promiscuous male advertisement-singing on traditional high perches and displaying on traditional low understorey perches; female builds and attends nest alone. Displays performed on slim, gently to steeply sloping branch, bamboo, grass or vine stem within 1–3 m of forest floor and with foliage directly above; male defoliates immediate area of display perches; two adjacent resident adult males were c. 300 m apart. Solitary courtship display consists of inverted Static Display only (lacks Convergence Display and ritualized Copulatory Sequence of congeners). Nest a sparse deep circular bowl of long, supple green stems of epiphytic orchids, pandanus (*Pandanus*) leaves, fibre of palm leaves, casuarina (*Casuarina*) needles, and few or no other leaves, lined with supple woody fine tendrils, possibly of vines, built c. 4–19 m above ground in variety of sites, from low bush to tall subcanopy tree. Clutch 1 egg, possibly rarely 2; incubation at one nest more than 18 days; parent aggressive towards conspecifics and to other bird-of-paradise species near nest with chick; no information on duration of nestling period.

Movements. Presumably resident.

Status and Conservation. VULNERABLE. Restricted-range species: present in Central Papuan Mountains EBA. CITES II. Uncommon throughout range; absent from some areas that appear suitable; somewhat more plentiful in certain areas, such as remnant forest and secondary growth on cleared mountain slopes of Kaindan area, near Kompiam. Global population estimated at fewer than 10,000 individuals. Main threat is habitat loss, combined with hunting for its plumes and tail feathers. Along one forest ridge 2 km long, 15 males called from non-overlapping advertisement territories, with mean nearest-neighbour distance c. 220 m, and mean distance separating 12 calling males on another ridge 3·5 km long was c. 400 m; advertisement-singing areas of these males did not apparently overlap, whereas all-purpose home ranges may have done. At another study site, density of males lower, each occupying up to 100 ha, this possibly due to more patchy nature of forest or greater hunting pressure. Although displaying males usually use patches of primary forest, this species is often seen in forest edge and nearby disturbed areas and may be able to survive in old secondary forest or fragmented primary forest; on other hand, it is likely excluded from more degraded habitats as a result of competition with more adaptable *P. raggiana*, combined with hunting of males. Vast areas of highland valleys and their slopes have aleady been cleared for agriculture and dwellings, and even today adult males continue to be hunted for their plumes; remaining forest is under pressure for clearance for agriculture by increasing human population. This species' relatively narrow elevational preference is very similar to that preferred by swidden gardeners, and ever-increasing human population will probably cause its extirpation from several intermontane valleys. Nevertheless, significant areas of its range are inaccessible and largely uninhabited, giving reason for some optimism with regard to its survival in the short term.

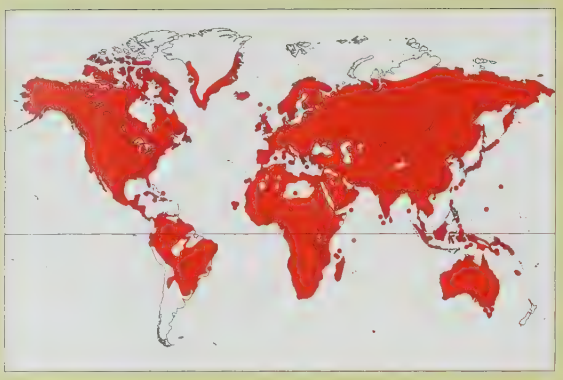
Bibliography. Anon. (2008j), Beehler (1978b, 1983b, 1989a), Bishop & Frith (1979), Butchart & Stattersfield (2004), Coates (1990), Cracraft (1992), Crandall (1921, 1932), David *et al.* (2009), Frith, C.B. (1998), Frith, C.B. & Beehler (1998), Frith, C.B. & Frith (1996a, 1997b), Gilliard (1950, 1969), Goodfellow (1926b), Gyldenstolpe (1955a), Healey (1986), LeCroy (1981b), Mack (1992), Majnep & Bulmer (1977), Mayr & Gilliard (1954), McCarthy (2006), Peckover (1990), Pratt (1984), Pratt & Stiles (1983), Pruett-Jones & Pruett-Jones (1986, 1988a), Schodde (1976), Simpson (1942), Smyth (1970), Stattersfield & Capper (2000), Whiteside (1995, 1997).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family CORVIDAE (CROWS)



- Medium-sized to large passerines with strong bill, sturdy legs, many species with black, grey or black-and-white plumage, often with metallic gloss, or blue, green, yellow, violet or brown.
- 20–69 cm.



- Almost cosmopolitan.
- Almost all terrestrial habitats; many species in towns and villages.
- 24 genera, 123 species, 359 taxa.
- 12 species threatened; 1 extinct in the wild since 1600.

Systematics

One of the best-known of avian groups, the family Corvidae has fascinated man for millennia. Images of these birds grace the cave walls of early humans. Their voices and actions stimulate human language and cultures, and their vernacular names, those of crow, raven, jay and magpie, are familiar almost everywhere. Exceptional memory, enormous curiosity, attractive movements, high sociability, varied vocalizations, and ecological plasticity are some features of the family that have so intrigued scientists and people around the world. Viewed as symbols of opportunism, quickly solving problems in laboratory experiments, and exploiting their wild environments with apparent cold calculation, as evidenced by such habits as the dropping of shellfish and nuts from suitable heights on to hard surfaces in order to break them, or the use of area-restricted search tactics to find eggs and nestlings of small birds, the crows have reached the position where few people remain indifferent to their abilities. With an extraordinary earlier adaptive radiation, the family Corvidae, with 24 genera and 123 species, has a worldwide distribution, its members living under a large variety of conditions, from the Arctic to the hottest deserts, at elevations from below sea-level to 6400 m, on islands and continents and in wild and urban areas.

Despite extensive radiation, all indications, from the first studies based on plumage patterns, behaviour, morphology and ecological affinities to recent investigations using a battery of molecular techniques, suggest that the family as presently constituted is derived from one ancestor. In other words, it is monophyletic. C. G. Sibley and J. E. Ahlquist proposed that the origin of the group could be traced to Australia, from which an ancestor was able to disperse to Asia. The group later radiated in Asia and Europe. Recent analyses by G. P. Ericson and collaborators of all genera of Corvidae, based on DNA sequences, support the proposal that the origin of this group dates to the splitting of the Australo-Papuan tectonic plate from Antarctica in the early Tertiary, some 53 million years ago. This was the time when the oscine passerines, to which Corvidae belongs, originated, as the Australo-Papuan plate came close enough to Asia to allow birds to disperse to that continent. The fact that the largest number of genera of Corvidae is found in Eurasia, which has been mentioned since D. Goodwin's first monograph on the group, is congruent with such a theory. From Eurasia, corvids dispersed to Africa and the Americas, resulting in the nearly worldwide present-day distribution; the family is absent only from Antarctica and some oceanic islands. The ancestor of Corvidae was, almost certainly, a forest-dweller. By the time when oscines started to radiate extensively, in the late Oligocene and the Miocene, 28–7 million years ago, the early Tertiary rainforests of Australia had been largely replaced by savanna-like forest or even drier vegetation. Such changes on the Australian continent likely challenged this forest-adapted ancestor and may have stimulated the movement and early radiation of Corvidae.

The relationship of Corvidae to other avian families has been debated for a long time. On the basis of similarity in egg-albumen protein, the family Laniidae, containing the true shrikes of the genera *Lanius*, *Corvinella* and *Eurocephalus*, was considered the sister-group of Corvidae in the 1980s. DNA annealing rates placed



The New World jays form a large, well-defined group, which has radiated to inhabit tropical, subtropical and mild temperate regions. Their ancestor would have reached North America some 8–10 million years ago. All the species share a characteristic configuration of the lower jaw known as the buttress complex. The ***Pinyon Jay*** *is the only member of its genus, and differs from other New World jays in having eleven rather than ten secondaries. The male of this dull blue crestless species has a brighter blue head.* Gymnorhinus *means "bare nostrils"; among corvids, the Pinyon Jay shares this feature only with the Rook* (Corvus frugilegus) *and the Crested Jay* (Platylophus galericulatus).

[*Gymnorhinus cyanocephalus*, Oregon, USA. Photo: Brian E. Small]



Little is certain about the taxonomic affinities of the ***Crested Jay****, a little-known species restricted to the Malay Peninsula and the Greater Sundas. It may not be a corvid at all, instead closer to the helmet-shrikes (Prionopidae) or bush-shrikes (Malaconotidae), and indeed an alternative name is "Crested Shrike-jay". Its long, nodding crest is unique, and it lacks both the nasal tuft of bristles and the unspotted juvenile plumage common to other members of the family. For the present, it is still treated as a member of Corvidae, though possibly a very primitive one.*

[*Platylophus galericulatus galericulatus*, Java. Photo: Roland Seitre]

the traditional corvid species as the tribe Corvini within the subfamily Corvinae in the family Corvidae. In this Sibley and Ahlquist classification of the 1990s, the subfamily Corvinae included, besides the tribe Corvini, the tribes Paradisaeini (the birds-of-paradise), Artamini (the woodswallows) and Oriolini (the Old World orioles); in this arrangement, the butcherbirds (Cracticidae) were included within Artamini. More recently, K. Helm-Bychowski and J. Cracraft, using molecular data, suggested that the family Corvidae is a sister-group of the birds-of-paradise (Paradisaeidae). This work concluded that the bowerbirds (Ptilonorhynchidae) were basal to the group composed of Paradisaeidae, Corvidae, Laniidae and Vireonidae (the vireos). The forest-dwelling habits of the Paradisaeidae seem also to corroborate the suspected forest-adapted habits of the ancestor of Corvidae.

Using a variety of molecular techniques, Ericson and collaborators suggest that the oldest branches of Corvidae include taxa that are mostly confined to the forests of south-eastern Asia, namely the genera *Crypsirina*, *Dendrocitta*, *Platysmurus*, *Temnurus*, *Cissa* and *Urocissa*. This area is the one in which the ancestral corvid presumably first arrived from the Australo-Papuan region some 53 million years ago. The exception is the chough genus *Pyrrhocorax*, which is distributed in mountain areas from the Himalayas west to western Europe. In an early molecular-genetic study, A. Cibois and E. Pasquet used cytochrome *b* analysis to suggest that *Pyrrhocorax* was the oldest lineage within the family. Recently, using characters of the tongue skeleton (apparatus hyobranchialis), A. Manegold corroborated the position of *Pyrrhocorax* as being outside the core-

The two members of the genus Cyanocitta, *the* ***Blue Jay*** *and Steller's Jay* (C. stelleri), *are such close relatives that they interbreed where their ranges meet in the US Midwest. Both are woodland species, and in common with other woodland-dwelling members of the family, such as other jays and some magpies, they have relatively short, rounded wings which are flapped rapidly. Across the Blue Jay's range, which extends from Canada to Florida, there are four races, which become progressively smaller towards the south.*

[*Cyanocitta cristata bromia*, Maple Grove, Quebec, Canada. Photo: Scott Linstead/ VIREO]





Three of the five species of Aphelocoma *currently recognized were formerly considered races of the same species, known simply as the Scrub Jay. But although the Island* (A. insularis), *Florida* (A. coerulescens) *and* ***Western Scrub-jays*** *have very similar plumage, there are considerable vocal and behavioural differences between them. There have been further proposals to split the Western Scrub-jay into two species, based partly on the completeness of the blue breastband, and the differences between the stronger, more hooked bill of the acorn-feeding Pacific population and the slimmer bill of the pinyon-nut-feeding inland birds.*

[*Aphelocoma californica woodhouseii*, Franktown, Colorado, USA. Photo: Dave Maslowski/ Maslowski Productions]

group Corvidae. This was contrary to the traditional position of *Pyrrhocorax*, which was thought to be closely related to *Corvus* and *Nucifraga* because of common osteological, morphological and ecological characters. *Pyrrhocorax*, however, differs from those two genera in having smooth, rather than scaled, tarsi, very short and dense nasal feathers and brightly coloured bill and feet, and in being mainly insectivorous, using the slender and decurved bill to pick and dig its prey from ground or rock crevices. Two species of *Pyrrhocorax* are recognized: the Red-billed Chough (*Pyrrhocorax pyrrhocorax*) and the Yellow-billed Chough (*Pyrrhocorax graculus*).

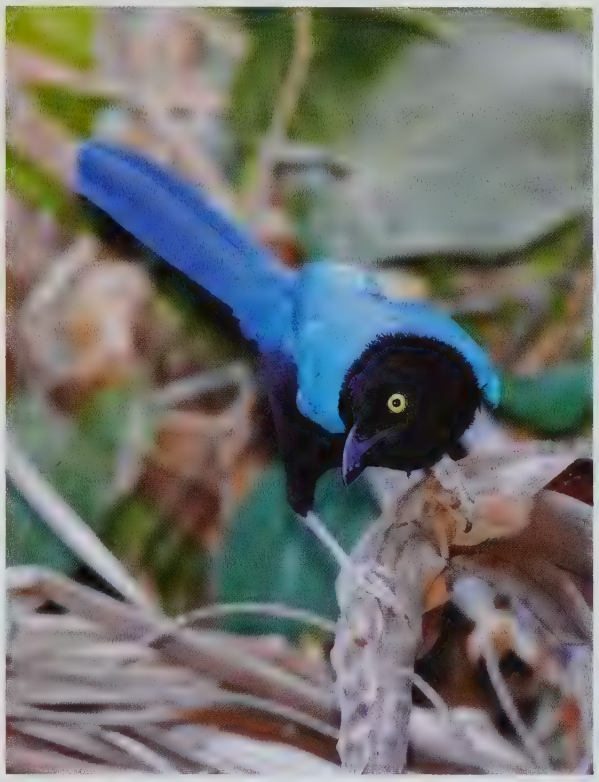
The species commonly known as treepies (*Crypsirina*, *Dendrocitta* and *Temnurus*) and some of the genera called magpies (*Platysmurus*, *Cissa* and *Urocissa*) inhabit mainly tropical and subtropical forest. Treepies do not have bright colours and have a thick bill with a strongly curved culmen. Both D. Amadon and Goodwin considered *Dendrocitta* and *Temnurus* as subgenera of *Crypsirina*, but this treatment was not formally recognized. Recent DNA sequences indicated a closer relationship of *Temnurus* with *Platysmurus*, both of which have stiffened feathers on the forehead, than with the other two genera of treepies. *Crypsirina* is composed of two species, the Racquet-tailed Treepie (*Crypsirina temia*) and the Hooded Treepie (*Crypsirina cucullata*), which have ten tail feathers, whereas most of the other treepies have twelve. In addition, both *Crypsirina* have the two central tail feathers with an expanded spoon-shaped tip. The Ratchet-tailed Treepie (*Temnurus temnurus*), in a monoptypic genus, also has an unusual tail, which is graduated and composed of ten feathers each widely forked at the tip, the outer points of the fork projecting on each side of the closed tail. *Dendrocitta* has the longest tail among the treepies and forms a rather homogeneous group of closely related species. The Grey Treepie (*Dendrocitta formosae*), the Sumatran Treepie (*Dendrocitta occipitalis*), the Bornean Treepie (*Dendrocitta cinerascens*) and the White-bellied Treepie (*Dendrocitta leucogastra*) have similar and probably homologous plumage patterns and allopatric distributions, and they form a species group. The Rufous Treepie (*Dendrocitta vagabunda*) is variable in colour intensity over its wide range. The Collared Treepie (*Dendrocitta frontalis*), restricted to the eastern Himalayas, is smaller than the aforementioned members of its genus, and has a deeper bill with a much more strongly curved culmen and commissure. Perhaps it is the case that the Rufous Treepie and the Collared Treepie have only a distant relationship. The smallest *Dendrocitta*, however, is the Andaman Treepie (*Dendrocitta bayleii*), confined to the Andaman Islands. Placed in a genus of its own, the Black Magpie (*Platysmurus leucopterus*) is considered an early treepie, although it is more heavily built and has a proportionately shorter tail.

Another monotypic genus, *Platylophus*, was not evaluated in the molecular analyses of the family by Ericson and colleagues because its taxonomic position is not clear. In fact, the corvid affinity of the Crested Jay (*Platylophus galericulatus*) has for



Cyanolyca *jays are small and sleek. They are rather uniformly dark blue except for a black mask, and in some cases a patterned head, such as the azure-blue crown of this species. The* ***Azure-hooded Jay****, found in cloudforest and upland oak woodlands from Mexico to Panama, is the most widely distributed member of the genus. It forms a species pair with the Beautiful Jay* (C. pulchra), *which is found in similar habitat on the northernmost slopes of the Andes. Most* Cyanolyca *jays have very restricted ranges, usually in montane humid forests.*

[*Cyanolyca cucullata*. Photo: John S. Dunning/ Ardea]



*The **San Blas Jay** is one of four closely related species which were previously assigned to their own genus,* Cissilopha, *because they retain their immature bare-part colours for longer than other New World jays. Although similar in plumage, with black heads and underparts and blue upperparts and tails, the four differ from each other in habitat preference and social behaviour. The highly social San Blas Jay chooses open woodland in lowland areas, and takes readily to cultivated areas, having a particular affinity for coconut groves.*

[*Cyanocorax sanblasianus nelsoni*, Mismaloya, Jalisco, Mexico. Photo: Rick & Nora Bowers/VIREO]

long been questioned; this species may not be a corvid at all, or, at least, it must represent one of the most primitive of the family. It has been suggested that it would be better placed in the African family of bush-shrikes (Malaconotidae), but, for the time being, it is perhaps better to leave it in the crow family.

The three green magpies making up the genus *Cissa* and the five blue magpies in *Urocissa*, inhabiting mostly forests of south-eastern Asia, are among the most colourful species in the family. The Sri Lanka Blue Magpie (*Urocissa ornata*) links the green magpies and the blue magpies, illustrating the close relationship between the genera, which was supported in the genetic study of Cibois and Pasquet. The difference in head markings, used in the past as a criterion for separating the blue magpies from the green, have been shown to be unreliable, because juveniles of the Red-billed Blue Magpie (*Urocissa erythroryncha*) and Yellow-billed Blue Magpie (*Urocissa flavirostris*) have head markings very similar to those of the green magpies. The Taiwan Blue Magpie (*Urocissa caerulea*), the Red-billed Blue Magpie and the Yellow-billed Blue Magpie form a superspecies. The White-winged Magpie (*Urocissa whiteheadi*), with its dusky body, is a unique blue magpie, sometimes allocated its own monotypic genus, *Cissopica*. The species of green magpie form a group with complex taxonomic relationships. In the past, the number of species in the genus *Cissa* varied from six to no more than two. In the present treatment, three species are recognized. These are the Common Green Magpie (*Cissa chinensis*), the Indochinese Green Magpie (*Cissa hypoleuca*) and the Short-tailed Green Magpie (*Cissa thalassina*), and they form a superspecies.

Ericson and co-workers showed that the later radiation of the Corvidae was associated with an adaptation to drier habitats. For example, the genera *Cyanopica*, *Perisoreus*, *Garrulus* and *Pica*, with geographical distributions partly in Asia, represent an adaptation to drier conditions. Extreme specialization on dry habitats is demonstrated by *Ptilostomus* and *Zavattariornis*, which inhabit dry grasslands in Africa, and *Podoces*, which lives in deserts of Iran and Central Asia. Ericson and collaborators suggested that *Perisoreus* was closely related to *Cyanopica*, and that the clade of these two in turn formed a trichotomy with the New World jays of the genera *Cyanolyca*, *Cyanocitta*, *Gymnorhinus*, *Aphelocoma*, *Cyanocorax*, *Calocitta* and *Psilorhinus* on the one hand and, on the other, the large group of core Old World taxa represented by *Zavattariornis*, *Ptilostomus*, *Podoces*, *Garrulus*, *Pica*, *Nucifraga* and *Corvus*.

So, modern analyses do not fully support some old and widely held theories about the systematic relationships among jays. For example, the supposed relationship between the Palearctic jays in the genus *Garrulus* and the American jays in *Cyanocitta*, based upon the barred pattern in the wing and tail feathers, which had already been rejected by J. W. Hardy in the 1960s, is not supported at the present time. In addition, the relationship between the Palearctic jay genera *Perisoreus* and *Garrulus* is rather distant in the modern analyses, despite morphological similarities between the Sichuan Jay (*Perisoreus internigrans*) and the Black-headed Jay (*Garrulus lanceolatus*). Nevertheless, in the recent study by Manegold, using characters of the tongue skeleton, the position of *Perisoreus* was closer to that of *Garrulus* than would be expected from the findings of Ericson and collaborators.

The genus *Cyanopica* presents an interesting disjunct distribution, with the Asian Azure-winged Magpie (*Cyanopica cyanus*) in the eastern Palearctic and the Iberian Azure-winged Magpie (*Cyanopica cooki*) in Spain and Portugal. It was thought that Portuguese merchants and sailors brought this corvid from China to Europe, but differences between the two forms suggest that the European population has been isolated for an exceedingly long time. Similarities between Palearctic Asia and Iberia in the seasonally hot maritime climate make it possible that *Cyanopica* had a more continuous range in the distant past. The recent discovery of *Cyanopica* bones from late Pleistocene sites in Gibraltar, in the extreme south Iberian Peninsula, reinforces the idea that colonization of Europe by this genus was not the result of human introduction. In the genus *Perisoreus*, the least colourful of the jays, the three species probably represent a superspecies. Two of them occur over a large area in the higher latitudes of the Northern Hemisphere, the Siberian Jay (*Perisoreus infaustus*) in Europe and Asia and the Grey Jay (*Perisoreus canadensis*) in North America. In contrast, the third species, the Sichuan Jay, has a quite restricted distribution, limited to a small area in central China. *Perisoreus* is unique among the Corvidae in having special mucus-secreting glands inside the mouth. *Cyanopica* and *Perisoreus* are thought to have diversified in the Old World before a Siberian form of the latter dispersed across the Bering landbridge to North America 1·5 million years ago.



*Although jays and magpies generally have longer tails than other corvids, the tail of the **Black-throated Magpie-jay** is exceptional, making up more than half the length of the bird. The waving tails draw even more attention to groups of these noisy and conspicuous birds, which are found only in a small area of north-west Mexico. This species overlaps slightly with its sole congener, the much more widespread White-throated Magpie-jay* (Calocitta formosa), *which has a shorter, but still exceptional, tail. They are most closely related to* Cyanocorax *jays, and have sometimes been considered a single species. The two interbreed in Jalisco and Colima, where birds with intermediate plumage are locally common.*

[*Calocitta colliei*, Mexico. Photo: Roland Seitre]



*Some New World jays are described as dull, relative to other members of their group, but only the **Brown Jay** could be called dingy. This species, assigned to a genus of its own, has one particularly distinctive feature: when calling, it inflates a small, bare pouch on its chest. There are two colour morphs, the plain-tailed, shown here, and the white-tipped. Once thought to be separate species, the two forms occur within the same populations in Mexico.*

[*Psilorhinus morio palliatus*, Texas, USA. Photo: Brian E. Small]

The New World jays comprise a well-defined and large group of corvids which have radiated extensively to inhabit tropical, subtropical and mild-temperate regions. The monophyly of this Corvidae group is supported not only by data derived from DNA sequencing, but also by the structural configuration of the jaw articulation, the buttress complex (see Morphological Aspects), described by R. L. Zusi. The ancestor, probably a jay-like bird closely related to *Cissa* and *Urocissa*, reached North America in the Miocene, 10–8 million years ago, presumably by following the trans-Bering route, later entering South America in the early Pliocene when the Isthmus of Panama was formed, 5·3–3·6 million years ago. A. Espinosa de Los Monteros and Cracraft used cytochrome *b* sequences to suggest that *Cyanolyca* is the most basal of the New World jays, with the genera *Cyanocitta*, *Aphelocoma* and *Gymnorhinus* as the most derived clade of that group, and the clade formed by *Cyanocorax*, *Calocitta* and *Psilorhinus* as the intermediate one. Such an arrangement was corroborated by Ericson and collaborators, using the mitochondrial DNA control region. Thus, modern analyses do not support the behavioural and morphological hypothesis of Hardy, who had proposed two main evolutionary lineages of New World jays, one an "Inornate Line", with the genera *Aphelocoma* and *Cyanolyca*, and the other an "Ornate Line", with the remaining genera. Hardy's arrangement had placed *Aphelocoma* at the base of New World jays and closely related to *Cyanolyca*, but this has not been borne out by molecular analyses.

In the most recent study of phylogenetic relationships of New World jays, E. Bonaccorso and A. T. Peterson used DNA sequences from three mitochondrial and two nuclear loci from 16 species, combined with their historical biogeography. Besides supporting the relationships as presented above, the results indicated that the ancestral distribution area of New World jays is restricted either to Middle America or to the combined region of Middle America and North America. The genus *Cyanolyca* and the *Cyanocorax–Calocitta–Psilorhinus* clade originated in Middle America, whereas the Green Jay (*Cyanocorax yncas*), the



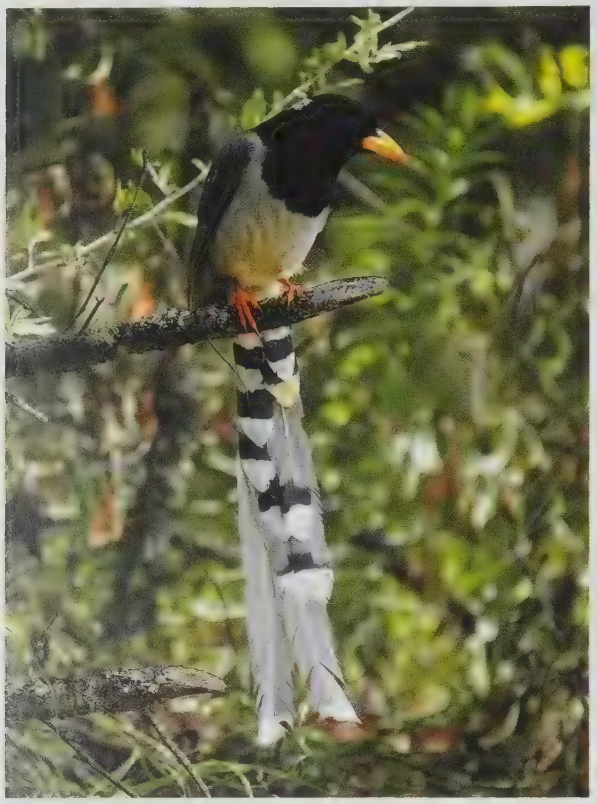
The Palearctic genus Garrulus *includes both the widely distributed Eurasian Jay* (G. glandarius), *which exhibits the most extreme racial variation of any corvid, with 34 subspecies, and the **Black-headed Jay**, a monotypic form confined to the forested slopes of the western Himalayas. There are striking similarities in the barred pattern of the wings and tail of Black-headed, Eurasian and Blue Jays* (Cyanocitta cristata), *but this is not thought to signify a close relationship between* Garrulus *and the New World genus* Cyanocitta.

[*Garrulus lanceolatus*, Sat Tal, Uttarakhand, N India. Photo: Marc Guyt/AGAMI]



Small and superficially not looking much like a typical jay, the ***Siberian Jay*** *is one of the most widespread of the corvids. Its North American equivalent is the Grey Jay* (Perisoreus canadensis) *and together the two span the higher latitudes of the Northern Hemisphere. Both are characteristic species of the boreal taiga forest. Siberian Jays vary in colour, being greyest in central Siberia, and more rufous towards the east and west, with further variations, particularly in the amount of rufous in the wing, from south to north. There is much debate over how many races should be recognized, with some authorities proposing as many as 17 and some as few as four; nine are recognized herein. Along with the third member of the genus, the restricted-range Sichuan Jay* (P. internigrans), *the Siberian and Grey Jays are alone among the Corvidae in having mucus-secreting glands inside the mouth. The mucus is used to produce food balls which are stuck firmly to trees for storage.*

[*Perisoreus infaustus infaustus*, Kuusamo, Finland. Photo: Markus Varesvuo]



The ancestral corvid from the Australo-Papuan subregion probably arrived in the forests of southern and eastern Asia some 53 million years ago. Molecular studies suggest that the genera found here are some of the oldest branches of the Corvidae, including the green magpies (Cissa) *and the blue magpies* (Urocissa). *The* ***Yellow-billed Blue Magpie*** *replaces the Red-billed Blue Magpie* (U. erythroryncha) *at higher elevations in the Himalayas.* Cissa *and* Urocissa *are very closely related, and juvenile Yellow-billed and Red-billed Blue Magpies have head markings very similar to those of the green magpies.*

[*Urocissa flavirostris flavirostris*, Bhutan.
Photo: Michael Noonan/ VIREO]

South American *Cyanolyca* and the South American *Cyanocorax* each represent an independent invasion of South America.

Cyanolyca species are small and sleek jays, uniformly dark blue except for a black mask, inhabiting forests of Middle and South America, where they are usually found at higher altitudes, at up to 4000 m above sea-level. All four of the species living in South America have a restricted geographical distribution, centred in the northern Andes. Three of these South American species, the Black-collared Jay (*Cyanolyca armillata*), the White-collared Jay (*Cyanolyca viridicyanus*) and the Turquoise Jay (*Cyanolyca turcosa*), form a superspecies; the Beautiful Jay (*Cyanolyca pulchra*) probably forms a species pair with the Middle American Azure-hooded Jay (*Cyanolyca cucullata*), which has the largest distribution of any member of this genus. The other Middle American forms, namely the Black-throated Jay (*Cyanolyca pumilo*), the Dwarf Jay (*Cyanolyca nanus*), the Silvery-throated Jay (*Cyanolyca argentigula*) and the White-throated Jay (*Cyanolyca mirabilis*), may comprise a separate superspecies. In a recent study based on the analysis of two mitochondrial and three nuclear loci, such general relationships among the *Cyanolyca* species were strongly supported. In this study, Bonaccorso suggested that *Cyanolyca* comprises two major clades, one containing most of the Middle American jays and the other consisting of two subgroups; one of these subgroups comprised the Beautiful Jay and the Azure-hooded Jay, and the other the remaining South American species.

The genus *Cyanocorax*, occurring from the southern USA southwards to Uruguay, is quite diverse. Its 16 species include colourful ones, such as the Plush-crested Jay (*Cyanocorax chrysops*), and drab ones, such as the Purplish Jay (*Cyanocorax cyanomelas*), and they are found in a variety of habitats ranging from forest and forest borders to savanna and dry scrub. One possible new species of *Cyanocorax*, not yet formally described, was recently discovered in Amazonia. Particularly in South America, there are several members of this genus living in open terrain, perhaps because of the absence on that continent of *Corvus* crows, a genus of open country; one such example is the Curl-crested Jay (*Cyanocorax cristatellus*). The Green Jay, occurring in both Middle and South America and formerly accorded a monotypic genus, *Xanthoura*, was placed by Bonaccorso and Peterson at the base of the *Cyanocorax* tree. Four species of *Cyanocorax* in Middle America, namely the Bushy-crested (*Cyanocorax melanocyaneus*), San Blas (*Cyanocorax sanblasianus*), Yucatan (*Cyanocorax yucatanicus*) and Purplish-backed Jays (*Cyanocorax beecheii*), are similar to each other in plumage pattern, but exhibit strong differences in habitat use and social behaviour. In the past they were grouped in a separate genus, *Cissilopha*, being unusual among the Corvidae in retaining immature colours for prolonged periods. Bonaccorso and Peterson's analysis indicated that the Bushy-crested Jay and the Yucatan Jay are sister-species, a relationship already detected in earlier morphological studies. Among the other species of *Cyanocorax*,



Over time, the number of species recognized in the genus Cissa *has varied from six to no more than two. Three are currently recognized: the Common* (C. chinensis), *Indochinese* (C. hypoleuca) *and* ***Short-tailed Green Magpies****. Together they form a superspecies. The Short-tailed, the most restricted in range, with two isolated populations on Borneo and Java, is sometimes lumped with the Indochinese species. Their bright colours—pea to emerald green bodies, black bandit masks and red bills and legs—blend surprisingly well with tropical forest vegetation. In direct sunlight, in captivity and in museum collections, the bright green plumage can fade to a dull pale blue.*

[*Cissa thalassina jefferyi*, Borneo.
Photo: Roland Seitre]



The discovery of fossil Cyanopica *bones in Gibraltar laid to rest the myth that sailors had brought azure-winged magpies from China to the Iberian Peninsula. Differences between the Iberian* (C. cooki) *and* ***Asian Azure-winged Magpies*** *suggest the European population has been isolated for a very long time; DNA studies suggest at least one million years. Both are found in seasonally hot, maritime regions, and it is possible that prior to the last glaciation, they were at opposite ends of a range that spanned southern Eurasia. There are examples from other families of species pairs with similarly disjunct ranges.*

[*Cyanopica cyanus japonica*, Tokyo, Japan. Photo: Tadao Shimba]

the Plush-crested Jay, with a large geographical distribution in central South America, forms a species pair with the White-naped Jay (*Cyanocorax cyanopogon*) of north-eastern Brazil, the two showing similarities primarily in plumage pattern and secondarily in voice. It was suggested that these two species could form a superspecies with the Cayenne Jay (*Cyanocorax cayanus*), the Black-chested Jay (*Cyanocorax affinis*) and the White-tailed Jay (*Cyanocorax mystacalis*) in South America and with a species living in a tiny area of west Mexico, the Tufted Jay (*Cyanocorax dickeyi*). A stronger relationship between the Plush-crested and Tufted Jays, but not between the latter and the other Middle American species (the old genus *Cissilopha*), was corroborated in the study by Bonaccorso and Peterson. The Purplish Jay and the Azure Jay (*Cyanocorax caeruleus*), owing to similarities between them in plumage pattern and voice, are traditionally considered to be closely related to each other; the relationships of the Violaceous Jay (*Cyanocorax violaceus*) are not clear, although it is similar in plumage pattern to those two species. The Curl-crested Jay has a voice quite similar to that of the Azure Jay, but its plumage pattern seems closer to that of the Plush-crested Jay. Finally, the relationships of the Azure-naped Jay (*Cyanocorax heilprini*), a poorly known species that inhabits savanna woodland in Amazonia, are more uncertain.

Calocitta, containing the Black-throated Magpie-jay (*Calocitta colliei*) and the White-throated Magpie-jay (*Calocitta formosa*), occurs in open woodlands of Middle America. Both species are colourful, and possess an extraordinarily long tail and a tall, curving frontal crest. This genus is closely related to *Cyanocorax*.

The Brown Jay (*Psilorhinus morio*), restricted to Middle America, is a drab corvid with a bare inflatable sac on the chest. This structure, termed the "furcular pouch", is formed by hypertrophy of the cleido-traquialis muscles, which creates a median, non-paired extra interclavicular diverticulum. The pouch produces strange clicking sounds when the jay is vocalizing. The Scientific Committee of the American Ornithologists' Union placed the Brown Jay in the genus *Cyanocorax*, but Bonaccorso and Peterson, in their study of the phylogenetic relationships of New World Jays, suggested that this species be maintained in the monotypic genus *Psilorhinus*.

Combination of genetic and morphological characteristics is not conclusive for determining which one of the genera *Cyanocitta*, *Aphelocoma* and *Gymnorhinus* is basal for the Nearctic species. Bonaccorso and Peterson, however, proposed that *Cyanocitta* and *Aphelocoma* are more closely related to each other on the grounds of a morphological novelty: both genera present a unique bar lateral to the sclerotic ring. The two species of *Cyanocitta*, namely the Blue Jay (*Cyanocitta cristata*) and Steller's Jay (*Cyanocitta stelleri*), are close relatives of each other; indeed, they interbreed in contact zones in the Midwest region of the USA. Both of them inhabit forest and woodland habitats, including those in urban areas. *Aphelocoma*, with five species, is

The name ***Rufous Treepie*** *could be applied more or less to all of the* Dendrocitta *species. These closely related forms present variations on the same basic plumage pattern, though all can be easily distinguished. There are few overlaps in range, and where two do overlap, they have distinct habitat preferences. Where the Rufous Treepie coincides with the Grey Treepie* (D. formosae) *in the Himalayan foothills, it is found at lower altitudes, and is far more tolerant of cities, gardens and other human-adapted landscapes. Treepies are noisy birds with a distinctive, dipping flight, each dip terminated by an upward jerk. All have a short, stout bill with a curved culmen.*



[*Dendrocitta vagabunda vagabunda*, Ranthambore National Park, India. Photo: Marc Guyt/AGAMI]



The treepie genera Crypsirina *and* Temnurus *are black or black and grey birds with more ornately structured tails than most other corvids. The two central tail feathers of the Hooded* (C. cucullata) *and* ***Racquet-tailed Treepies*** *flare out to form a spatulate tip. They have only ten tail feathers, rather than twelve, like other treepies. They also have a cushion of short, soft feathers over the forehead and lores, instead of the nasal bristles of most corvids. Both are relatively small, at 30–33 cm including the long tail.*

[*Crypsirina temia*, Java.
Photo: Roland Seitre]

distributed in dry habitats of North America. Current genetic evaluations are contradictory and unable, therefore, to shed light on the question of whether the Western Scrub-jay (*Aphelocoma californica*) or the Unicoloured Jay (*Aphelocoma unicolor*) is basal to the other species of *Aphelocoma*. The Western Scrub-jay, the Island Scrub-jay (*Aphelocoma insularis*) and the Florida Scrub-jay (*Aphelocoma coerulescens*) are closely related to each other, having similar plumage patterns, but they exhibit strong differences in their breeding systems. They were formerly considered to be representatives of a single species, known as the "Scrub Jay", but it was suggested recently that this be split into two or three species. The remaining member of the genus, the Mexican Jay (*Aphelocoma ultramarina*), includes seven subspecies that are typically separated into three groups, but are now thought to constitute four. A monotypic species in a monotypic genus, the Pinyon Jay (*Gymnorhinus cyanocephalus*) is a New World corvid which, in bill morphology and foraging behaviour, resembles the nutcrackers (*Nucifraga*). This is the result of convergent evolution, all of these species having evolved to exploit large, nutritious seeds of pines (*Pinus*).



The mitochondrial genomes of the Common Magpie (Pica pica) *of Eurasia, and those of the Black-billed* (P. hudsonia) *and* ***Yellow-billed Magpie****, both of North America, are so close that they could be considered subspecies of a single species. The ancestor of the two North American species probably crossed the Bering land-bridge around 1·5 million years ago. Although the birds can appear simply black and white, their black feathers have an iridescent sheen which can shine blue, purple or green. Whereas tropical magpies are arboreal forest-dwellers,* Pica *magpies are terrestrial birds of more open country, with relatively long legs.*

[*Pica nuttalli*, Los Alamos, California, USA.
Photo: Rafael Armada]



The long legs of the four species of Podoces *ground-jay enable them to run very quickly, unlike all other corvids. They fly reluctantly and only for short distances, the extensive white on the wings making them conspicuous. On the ground, their cryptic coloration makes them hard to find and follow. In shape and posture they are unlike other corvids, and* ***Henderson's Ground-jay*** *and others are said to look like very large hoopoe-larks* (Alaemon).

[*Podoces hendersoni*, Buutsagaan, Mongolia. Photo: Andreas Buchheim]

In the molecular-genetic analysis by Ericson and colleagues, the ground-jays (*Podoces*) and the Piapiac (*Ptilostomus afer*) were grouped together, an unexpected result when one considers their different geographical distributions. These authors suggested that the adaptation of both genera to truly arid conditions was a single evolutionary event and that the disjunct distributions of the extant species could reflect later dispersal events and further specialization. The four species of ground-jay, with a geographical distribution restricted to Central Asia, are remarkable within the family because they run extremely well on their relatively long legs and hold the body in a horizontal posture. Pander's (*Podoces panderi*) and Pleske's Ground-jays (*Podoces pleskei*) form a species pair, while Henderson's (*Podoces hendersoni*) and Biddulph's Ground-jays (*Podoces biddulphi*) form another one. The Piapiac, in a monotypic genus, resembles the Long-tailed Glossy Starling (*Lamprotornis caudatus*) and occurs only in West and Central Africa.

It should be mentioned here that the Ground Tit (*Pseudopodoces humilis*) was, until recently, placed in the Corvidae, often in the genus *Podoces*. Osteological, morphological and vocal char-

In general, the bills of corvids are stout, strong and fairly long, with a slight hook at the tip of the upper mandible. More specialized versions include the straight, pointed bill of the ***Spotted Nutcracker*** *and its two congeners, which has a ridge on the inside of the lower mandible enabling the bird to crack nuts open. Although widely distributed in Eurasia, the Spotted Nutcracker, like its congeners, is closely linked with mountain coniferous forests. Nutcrackers are important dispersers of pine seeds, and Clark's Nutcracker* (Nucifraga columbiana) *and the whitebark pine* (Pinus albicaulis), *on which it depends, may have enabled one another's spread through the mountain ranges of western North America.*

[*Nucifraga caryocatactes caryocatactes*, Hanko, Finland. Photo: Markus Varesvuo]





Once considered to be close to the Corvus *crows and nutcrackers, the Red-billed* (Pyrrhocorax pyrrhocorax) *and* ***Yellow-billed Choughs*** *differ from them in having smooth, rather than scaled, tarsi, very short and dense nasal feathers, and brightly coloured bills and feet. They are specialized insectivores, using their long, curved bills to pick and dig up invertebrates. The Yellow-billed, also known as the Alpine Chough, replaces the Red-billed at higher elevations, though the two can occur together.*

[*Pyrrhocorax graculus graculus*, Dolomites, Italy. Photo: Harri Taavetti/FLPA]

acters, however, indicate that it belongs, in fact, with the tits and chickadees in the family Paridae, a conclusion supported by molecular-genetic details.

Stresemann's Bushcrow (*Zavattariornis stresemanni*), in another monotypic genus, is an unusual corvid that, because of its small size and sociable behaviour, resembles some starlings (Sturnidae). Its geographical distribution is quite restricted, being confined to a small area in southern Ethiopia. This species could be classified in a monotypic family, Zavattariornithidae, on the grounds that it exhibits a number of atypical features and several anatomical peculiarities, but DNA sequences have indicated that it is a true corvid, most closely related to *Podoces*, *Pica* and *Ptilostomus*.

From the available molecular data, the relationships of the genus *Garrulus* are not altogether clear, although it is evident that it forms part of a clade consisting of several Old World core groups. The Eurasian Jay (*Garrulus glandarius*) inhabits wooded areas, and is closely associated with several species of oak tree (*Quercus*) throughout its large geographical range in Eurasia. This species presents the most notable racial variation of any corvid, with some 34 subspecies normally recognized. In contrast, the Black-headed Jay and Lidth's Jay (*Garrulus lidthi*) occur in re-



From a distance, the ***Piapiac*** *can resemble a Glossy Starling* (Lamprotornis), *a similarity reinforced by its calls, and by its long graduated tail, though at closer quarters contradicted by its heavy crow-like head and stout bill. Isolated from most of the rest of the family in West and Central Africa—on a continent generally poor in corvid species—the Piapiac is placed in a monotypic genus for a number of morphological reasons. It is notable for commonly associating with mammals, feeding around their feet or sitting on their backs, where it will pick off ectoparasites. The bird with the pink bill in this picture is a juvenile.*

[*Ptilostomus afer*, Niokolo Koba National Park, Senegal. Photo: Jesús Rodríguez-Osorio]

stricted areas of, respectively, the western Himalayas and the islands of Japan.

The four magpies in the genus *Pica* are well-known corvids with a long tail and striking black-and-white plumage. Within the family, only the genera *Corvus* and *Perisoreus* have distributions larger than or comparable to that of the genus *Pica*. Greater homogeneity among magpie species compared with those genera may be due to the relatively recent spread of *Pica* over its present distribution or to a considerable resistance to variation. Evidence suggests a recent spread, because the mitochondrial genome of the Common Magpie (*Pica pica*), living in Eurasia, and those of the Black-billed Magpie (*Pica hudsonia*) and the Yellow-billed Magpie (*Pica nuttalli*), both living in North America, are so closely related that the three could be considered subspecies of a single species. Based on 1·6% mitochondrial DNA substitutions per million years, R. M. Zink and collaborators estimated that the ancestor of the Black-billed and Yellow-billed Magpies likely crossed the Bering land-bridge 1·5 million years ago, these two species then diverging in the middle Pleistocene. The Arabian Magpie (*Pica asirensis*) has usually been treated as a subspecies of the Common Magpie, but its very restricted range and isolation, coupled with differences in vocalizations as well as structural features, suggest that this taxon should be elevated to species rank.

With similarities in morphological characteristics and habits, the genera *Nucifraga* and *Corvus* are considered sister-taxa, a close relationship supported by recent genetic studies. The nutcrackers, in *Nucifraga*, have a long and pointed bill and a strong dependence during the winter months on the seeds of conifers. Three species are recognized. These are the Spotted Nutcracker (*Nucifraga caryocatactes*), living in Eurasia, the Kashmir Nutcracker (*Nucifraga multipunctata*), living in the western Himalayan forests of southern Asia, and Clark's Nutcracker (*Nucifraga columbiana*), living in North America. It is likely that an ancestor of Clark's Nutcracker, a Siberian form of the Spotted Nutcracker, crossed the Bering land-bridge when the climate cooled and conifer forests spread during the Pliocene, 5·3–1·8 million years ago; this was after the ancestor of the New World jays crossed the warmer, deciduous-forest land-bridge during the Miocene, 10–8 million years ago. This climate change would have favoured *Nucifraga*. This scenario is consistent with the recent expansion into North America of the whitebark pine (*Pinus albicaulis*), which is derived from the Eurasian stone pine (*Pinus cembra*). The strong co-evolutionary history of Clark's Nutcracker and the whitebark pine suggests that nutcrackers facilitated the pine's dispersal in North America. In addition, Clark's Nutcracker may have taken advantage of the earlier dispersal of the New World jays in North America, because these jays also assist the dispersal of some species of pine, such as the limber pine (*Pinus flexilis*), the Mexican pinyon (*Pinus cembroides*) and the common pinyon (*Pinus edulis*), providing nutritious seeds for colonizing nutcrackers.

The most species-rich genus of Corvidae is *Corvus*, which comprises the crows, rooks and ravens, a total of 44 species. This genus has an almost worldwide distribution, its members living in a variety of conditions, but it does not occur in South America. The species of *Corvus* have, in general, similar body shapes, featuring strong, stout legs with well-clawed, grasping feet, and a large head sporting a distinctive bill.

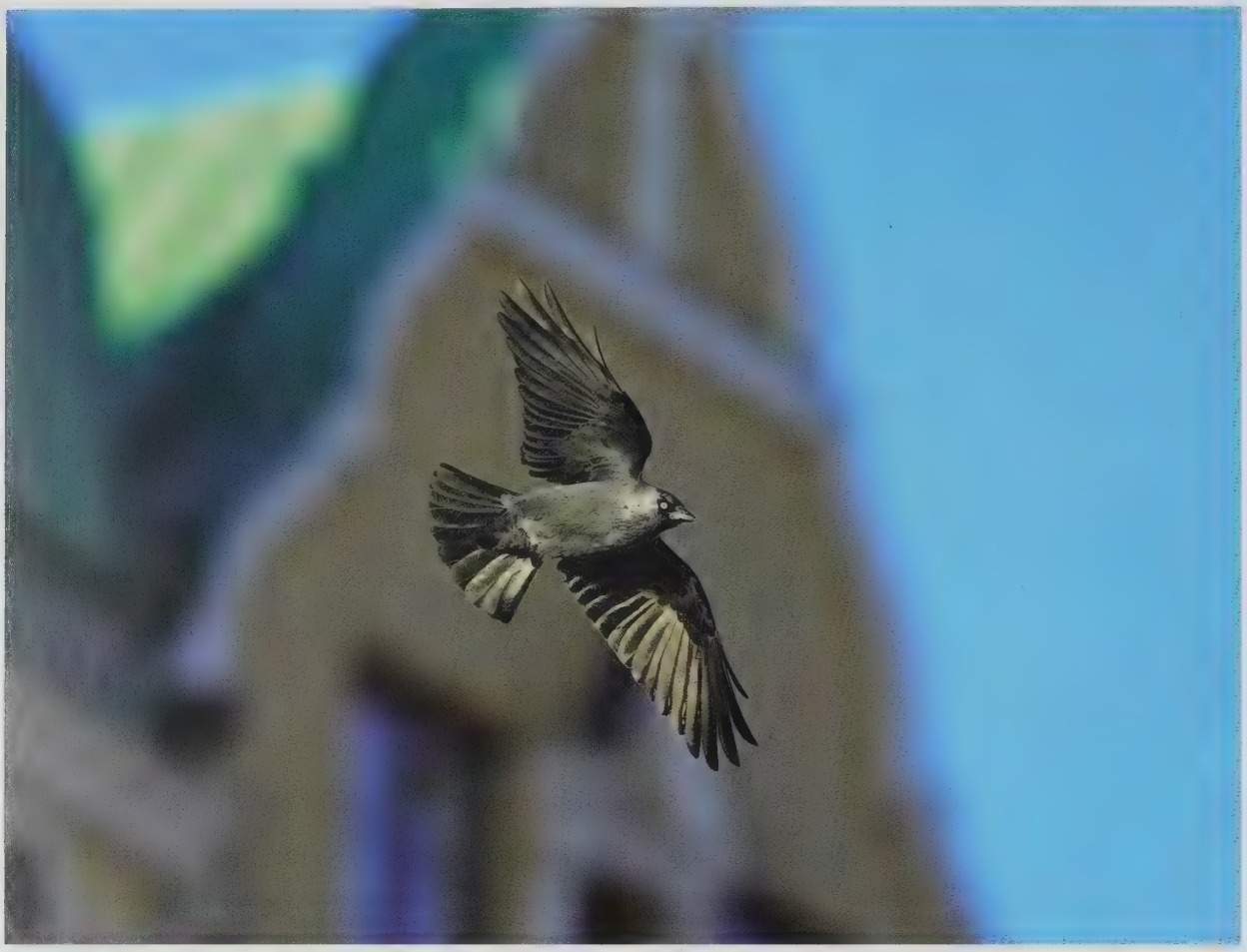
Recent molecular study has revealed that the Eurasian Jackdaw (*Corvus monedula*) is distantly related to other members of the genus *Corvus*. Moreover, it differs from them morphologically and behaviourally, having a slender bill and nesting in cavities. The monophyly of the genus *Corvus* as currently constituted is, therefore, poorly supported. This is reflected in some revised taxonomic classifications, which place the Eurasian Jackdaw and the Daurian Jackdaw (*Corvus dauuricus*) in a separate genus, *Coloeus*. The two jackdaws are so similar to one another that they could even be lumped in one polymorphic species if it were to be found that hybridization was more frequent in the region of Lake Baikal and Mongolia where the two overlap in range.

The remainder of the genus *Corvus*, however, appears certainly to be monophyletic, and the species are so similar that, in some cases, it is difficult to determine species boundaries. The Carrion Crow (*Corvus corone*) and the Hooded Crow (*Corvus cornix*), for example, have often been treated as conspecific, differing only in plumage colour, the former being all black and the latter grey and black. The two interbreed where their ranges overlap, and hybrids have variable and intermediate plumage features. The number of hybrid pairs, however, is lower than expected,



*The **Common Raven** is the largest corvid, and also the largest passerine in the world, reaching 69 cm in length and 2000 g in weight—although some Thick-billed Ravens* (Corvus crassirostris) *reach a similar size and weight. This species, like others that fly long distances, moults its larger primaries slowly, so that its flying ability is never impaired. The Common Raven is one of the most widespread bird species in the Northern Hemisphere, and is part of a relatively recent and rapid radiation of ravens. Speciation is continuing: at least three groups of Common Raven, in the Old World, the New World and the Canary Islands, are currently taking relatively independent evolutionary paths, with little if any genetic exchange.*

[*Corvus corax corax*, Kuusamo, Finland. Photo: Markus Varesvuo]





More than a third of the corvid species—44 out of 123—belong to the genus Corvus. *They are generally fairly similar in shape, with strong, stout legs ending in well-clawed, grasping feet, and large heads with powerful bills. The* ***Eurasian Jackdaw****, one of the smallest of this genus, has a comparatively slender bill, and unlike other* Corvus *species, nests in cavities. Recent molecular study suggests it is only distantly related to most of the rest of the genus, and some authorities place it, together with the very closely related Daurian Jackdaw* (C. dauuricus), *in their own genus,* Coloeus. *At the other extreme in overall size and massiveness of bill, the White-necked Raven* (C. albicollis) *of eastern and southern Africa and the* ***Thick-billed Raven*** *of the Ethiopian highlands form a species pair, and are also sometimes considered to represent a separate genus,* Corvultur. *However, with the probable exception of the jackdaws,* Corvus *crows appear to be monophyletic, and in several cases are so similar that it is difficult to determine species boundaries. Carrion* (C. corone) *and Hooded Crows* (C. cornix) *are often treated as conspecific, differing only in plumage colour, and interbreeding where their ranges overlap. The American Crow* (C. brachyrhynchos) *is extremely closely related to the Carrion Crow, the two species sharing a recent common ancestor.*

[Above: *Corvus monedula soemmerringii*, Helsinki, Finland. Photo: Markus Varesvuo.

Below: *Corvus crassirostris*, Ethiopia. Photo: Dick Forsman]



Found in central and southern Africa, the ***Pied Crow*** *has the largest range of any African corvid. Its distinctive white collar and breast set it apart from all other crows and ravens in its range except the White-necked Raven* (Corvus albicollis), *which is relatively massive in all its proportions, particularly the bill. Part of a radiation of African ravens which began 3·8–2·3 million years ago, the Pied Crow is known to hybridize with the Ethiopian Raven* (C. edithae) *where their ranges overlap. All members of Corvidae have ten primaries, the outermost being considerably reduced.*

[*Corvus albus*, Western Division, Gambia. Photo: Dick Forsman]

and sexual selection appears, therefore, to reinforce reproductive isolation between the forms. In a European context, it is likely that during the last ice age, in the Pleistocene, the two populations were forced to retreat to refugia, the grey-and-black form in the Balkans and the all-black one in Iberia. When climatic conditions changed, the two populations expanded and interbred, producing fertile hybrids. Differences between Carrion and Hooded Crows in vocalizations, as described by C. Palestrini and A. Rolando, and different levels of aggressiveness, have contributed to premating isolation of the two taxa. The striking plumage differences, the subtle differences in vocalizations, and both the narrowness and the plasticity of hybrid zones all suggest, therefore, that speciation has been at least partially achieved. The Carrion and Hooded Crows, and possibly also the Collared Crow (*Corvus pectoralis*), are presently best regarded as forming a superspecies complex.

The Carrion Crow is closely related to the American Crow (*Corvus brachyrhynchos*) of the Nearctic. According to R. C. Fleischer and C. E. McIntosh, they are only 5% divergent in cytochrome *b*. It is believed that a common ancestor of today's Carrion and American Crows inhabited Beringia 2–3 million years ago, and that it radiated in North America to produce the clade that includes the present-day American Crow, Northwestern Crow (*Corvus caurinus*), Jamaican Crow (*Corvus jamaicensis*), Cuban Crow (*Corvus nasicus*) and White-necked Crow (*Corvus leucognaphalus*). It is further thought that a second colonization of North America, either from Beringia or perhaps via a more southerly route, involved a common ancestor of Asian and Pacific crows that radiated into the Fish Crow (*Corvus ossifragus*), the Sinaloa Crow (*Corvus sinaloae*) and the Tamaulipas Crow (*Corvus imparatus*). These last three species are quite similar in appearance to the American Crow, but they can be separated by voice. Hybridization between the Northwestern Crow and the American Crow has led to debate over the years as to whether the former is merely a subspecies of the latter. J. Marzluff and T. Angel recently postulated that land conversion by humans facilitated the westward spread of American Crows and increased the incidence of their hybridization with Northwestern Crows to the point at which it is now unlikely that genetically distinct Northwestern Crows exist. The Palm Crow (*Corvus palmarum*) and the Hawaiian Crow (*Corvus hawaiiensis*) are probably the result of a more recent colonization by a mainland corvid; preliminary genetic analysis by Fleischer and McIntosh suggests that these species are actually more closely related to ravens than they are to crows.

In eastern Asia, the Large-billed Crow (*Corvus macrorhynchos*), with numerous subspecies and with a large distribution which includes islands, is possibly made up of a complex of as many as seven species. More research is, however, required, and this should include not only genetic and vocal comparisons, but also determination of their parasite lice (Mallophaga) and whether differences among forms are gradual or abrupt. Because of the head and bill shapes, it is suggested that the House Crow (*Corvus splendens*) has a close affinity to the Large-billed Crow complex. In Micronesia, the Mariana Crow (*Corvus kubaryi*) lives

Eurasian (Corvus monedula) *and* ***Daurian Jackdaws*** *are so similar that they could perhaps be lumped as one polymorphic species. They are more or less identical in size, and apparently identical in diet, calls and social behaviour. The primary differences are in the piebald plumage of the Daurian—though immature birds are all dark, like Eurasian Jackdaws—and the colour of the irides, which are pale grey in Eurasian and dark in Daurian Jackdaws. These differences, plus minor discrepancies in nesting behaviour, seem enough to keep the two species separate where their ranges overlap, and there is little evidence of hybridization.*

[*Corvus dauuricus*, Beijing, China. Photo: Yilun Qiao]





*The bare, pink face sets the **Grey Crow** apart from any other corvid. It also has an atypical juvenile phase, with pale, greyish brown plumage and a pink bill, shown here. Adults, though mainly dark in plumage, can have randomly bleached-looking wing and tail feathers. Confined to New Guinea, where it is widespread, the Grey Crow is part of an old endemic group of Melanesian island crows, many of them with very restricted ranges.*

[*Corvus tristis*, near Madang, NE New Guinea. Photo: Brian J. Coates]

on the islands of Rota and Guam and appears to be derived from the House Crow.

The Slender-billed Crow (*Corvus enca*) of south-eastern Asia has eight recognized subspecies falling in two groups, the "nominate group" and the "*violaceus* group". In the same region, the Banggai Crow (*Corvus unicolor*), confined to the Banggai Islands, off east Sulawesi, and the Piping Crow (*Corvus typicus*), restricted to the island of Sulawesi and the smaller islands of Muna and Buton, perhaps form a species pair, which has been considered to be related to the Slender-billed Crow complex; in fact, both species seem to represent an early offshoot of the "*Corvus enca* complex". The pied plumage of the Piping Crow, unique among Indonesian corvids, suggests that it may belong in its own genus (*Nesocorax*), which perhaps should also include the Banggai Crow. Possibly closest to the Banggai and Piping Crows is a unique little species known as the Flores Crow (*Corvus florensis*), which is endemic on the island of that name in the Lesser Sundas. The Long-billed Crow (*Corvus validus*) has also been considered closely related to the Slender-billed Crow, but its pale eyes suggest an affinity with the Australian crows.

The White-billed Crow (*Corvus woodfordi*), the Bougainville Crow (*Corvus meeki*), the Bismarck Crow (*Corvus insularis*), the Brown-headed Crow (*Corvus fuscicapillus*) and the Grey Crow (*Corvus tristis*) apparently form part of an "old endemic" Melanesian group. The New Caledonian Crow (*Corvus moneduloides*) is restricted to New Caledonia and the nearby Loyalty Islands.

Five species of *Corvus* live sympatrically in Australia. They are quite similar to each other, forming a closely related complex of crows which, in adulthood, have white eyes with a blue inner ring. Melanesian crows may be related to Australian crows, since all also have blue eyes at some stage of immaturity. Field identification of the Australian members of the genus is rather difficult, as the species form mixed gatherings outside the breeding season; their vocalizations, particularly those related to territory, are the key factor for field identification. The Australian Raven (*Corvus coronoides*), the Little Raven (*Corvus mellori*) and the Forest Raven (*Corvus tasmanicus*) are probably most closely related to each other. The Little Crow (*Corvus bennetti*) lives in arid areas of Australia. The Torresian Crow (*Corvus orru*) occurs in Australia, New Guinea, the Moluccas and other, nearby islands; the Australian population was formerly regarded as a full species, "*Corvus cecilae*".

Having an extensive geographical distribution in Europe and Asia, the Rook (*Corvus frugilegus*) is unique among the *Corvus* species on account of its unusual pointed bill and naked face, its strong association with open habitats and its sociable lifestyle. It probably evolved in grass steppes. In the analysis by Ericson and collaborators, using DNA sequences, the Rook was placed closer to the Common Raven (*Corvus corax*) than to the Australian Raven and the Eurasian Jackdaw.

The Common Raven, one of the most widespread of all bird species in the Northern Hemisphere, is part of a recent and rapid radiation of ravens. Four major raven lineages diverged from one another between 3·8 million and 1·7 million years ago; they have been considered to represent a complex of a few species of large-bodied birds that vary subtly in overall form and plumage. This radiation probably began some 3·8–2·3 million years ago, when the Pied Crow (*Corvus albus*) and the other African ravens diverged from each other. Because of the widespread distribution, at least three groups of the Common Raven are currently taking relatively independent evolutionary paths, with little, if any, genetic exchange: these are the Old World group, the New World group, and the Canary Islands group. The Common Raven crossed the Bering land-bridge about 2 million years ago; from this originated the "California clade" of the Common Raven and the Chihuahuan Raven (*Corvus cryptoleucus*). A second invasion by the Common Raven occurred about 25,000 years ago, again across the Bering land-bridge, this time probably with humans and grey wolves (*Canis lupus*), giving rise to the "Holarctic clade" of *Corvus corax*. The two Common Raven clades, although colonizing at different times, are now interbreeding and merging their gene pools, rather than continuing to diverge. For the groups of the Old World and the New World a variety of subspecies is recognized, and these may have been especially distinctive a million or so years ago. Today, however, such subspecies commonly reproduce in areas where they overlap in range, which reduces the genetic distinctiveness of the forms, with the result that they intergrade extensively and do not have unique mitochondrial signatures.

Marginally overlapping with the Common Raven in some regions of Africa are the closely related Brown-necked Raven



Social organization in corvid species can be complex, and can vary within the same species according both to season and region. ***Green Jays****, for example, are solitary breeders in the north of their range, but assemble in large flocks after breeding. Further south, they form territorial groups of three to nine birds, and they maintain these groups throughout the year. Flocks are much bolder than solitary birds. Hierarchies within groups can change quickly, without overt confrontations, and it is thought that the superior intelligence of corvids enables them to assess the physical and psychological fitness of other flock members.*

[*Cyanocorax yncas yncas*, San Isidro, Ecuador. Photo: Tui de Roy/ Roving Tortoise Photos]

(*Corvus ruficollis*), the Ethiopian Raven (*Corvus edithae*) and the Pied Crow, which comprise a superspecies. As with the Carrion and Hooded Crows, the Pied Crow and the Ethiopian Raven frequently hybridize, mainly in the south-eastern highlands of Ethiopia. The Cape Crow (*Corvus capensis*) is probably related to the Brown-necked Raven and the Pied Crow, although it resembles the Rook, especially in bill shape. Goodwin suggested that the bill-shape convergence reflects an adaptation for feeding in similar manner to that of the Rook, by probing and digging for invertebrates.

The two deep-billed ravens living in Africa, the White-necked Raven (*Corvus albicollis*) and the Thick-billed Raven (*Corvus crassirostris*), form a species pair, and are sometimes considered to represent a separate genus, *Corvultur*. Another mainly African raven, the Fan-tailed Raven (*Corvus rhipidurus*), also sometimes separated generically, in *Rhinocorax*, seems to



Gregarious throughout the year, there are three units in the social organization of the ***Red-billed Chough****: the pair; the family group; and the flock. Like most other corvids, this species mates for life, but although breeding pairs defend a territory, they join flocks when away from the nest. Towards the end of the summer, choughs can be found in flocks of 200 or more, but seem to maintain the family group within these large flocks when foraging. Both species of chough may make daily altitudinal movements of several kilometres between roosting and feeding sites.*

[*Pyrrhocorax pyrrhocorax*, China. Photo: Zhang Ming]



Large animal carcasses provide an important source of food, particularly in winter. But research has found that while resident single ***Common Ravens*** *or pairs defend carcasses from other ravens, vagrant birds without territories go out of their way to attract other ravens to feed with them at the carcasses they discover. The resident ravens will chase away single vagrant birds, but when these arrive in groups, will tolerate them and even feed with them. By recruiting other birds, the vagrants can overcome the aggressiveness of the resident birds. It has been suggested that an individual's status is enhanced by the number of followers it leads to carcasses.*

[*Corvus corax corax*, Finland.
Photo: Jari Peltomaki/ AGAMI]

be more closely related to the two deep-billed species than it is to the Common Raven.

Morphological Aspects

Members of this family are quite variable in body size. Crows and ravens can be large to very large, whereas some jays, magpies and others are only medium-sized. The Common Raven is the world's largest corvid, and also the largest passerine, reaching 69 cm in length and 2000 g in weight. The Dwarf Jay of Mexican humid pine–oak–fir (*Pinus–Quercus–Abies*) forest, with a size of 20–23 cm and weighing 40–42 g, is the smallest corvid. Bergmann's Rule, which predicts that individuals living in cooler climates tend to be larger than those of the same species in warmer climates, and Allen's Rule, which predicts that individuals in hotter environments tend to have longer appendages such as feet and bill, have been corroborated for some corvids, as was found in the extensive study of the Red-billed and Yellow-billed Choughs by P. Laiolo and Rolando.



According to Konrad Lorenz, an old German proverb says that one crow will not peck out the eye of another, and in his extensive studies of corvids Lorenz found this to be true. Fights between corvids, such as these ***Iberian Azure-winged Magpies****, are frequent, especially during breeding, when they may involve two or more pairs and their helpers. The birds fall to the ground with interlocked claws, pecking at one another, but fights are usually brief, and rarely end with serious damage. Appeasement displays involving presentation of vulnerable parts prevent real injury, and can avert aggression altogether.*

[*Cyanopica cooki*, Spain.
Photo: Luis Casiano]



Particularly when resources are short, corvids can be aggressive towards other species. Common Ravens (Corvus corax) *and other corvids have been observed tugging the feathers of feeding raptors such as Bald Eagles* (Haliaeetus leucocephalus) *until the larger birds are forced to give up their prey. This* ***Hooded Crow*** *may have similar intentions towards the young Herring Gull* (Larus argentatus), *and the young Great Black-backed Gull* (L. marinus) *appears interested in the possible outcome. The corvids exhibit the most complex play behaviour of all passerines, which includes playing tricks on other species, even when they have nothing to gain by doing so. Play behaviour has been studied in the Hooded Crow's near relative, the Carrion Crow* (C. corone), *and particularly in the Common Raven. It contains elements of practice for the serious business of life, and also of showing off prowess to potential mates and rivals. But some playful behaviour, such as repeatedly sliding down snow banks, appears to be done just for the fun of it. Sophisticated play behaviour is just one indication of the superior intelligence of the corvids. Their large heads accommodate a correspondingly large brain, considerably larger in relation to their body size than in any other birds. Perhaps surprisingly, the American Crow* (C. brachyrhynchos) *tops the list, having a larger brain than would be expected for its modest body size, relegating the Common Raven to second place. These are followed by other* Corvus *species, and then by other genera such as* Garrulus.

[*Corvus cornix cornix*, Oulu, Finland. Photo: Markus Varesvuo]



The fearless aggressiveness of the ***House Crow*** *has contributed to the seemingly irresistible spread of this highly invasive species. Its targets include any species which could constitute a threat, including all raptors, dogs and cats, and even humans. However, this fruit bat, an Indian flying-fox* (Pteropus giganteus), *is probably being pursued as potential prey. In Kenya, where introduced House Crows are a serious threat to native biodiversity, they are often seen noisily chasing fruit bats which may be killed and eaten.*

[*Corvus splendens splendens*, Tamil Nadu, India. Photo: Hanne & Jens Eriksen]

The basic morphological features of the family are the long tarsus, which is scaled in front and booted behind, the nature of the primaries and tail feathers, which are stiffened, and the presence of a tuft of nasal bristles extending to the nostril opening. The unspotted juvenile plumage is also a feature of the group, but with one exception, that of the Crested Jay.

Corvids of the genus *Corvus*, the jackdaws, crows and ravens, are characterized by their basic black coloration, although some variations include black and grey, black and white, and shades of grey. They are completely without bright colours, although the plumage often exhibits a purple, blue, green or silver sheen. In contrast, some species of jay and magpie are among the most colourful and brightest of birds. It seems that the genus *Corvus*, having lost the ability to produce carotenoid pigments or structural blue, is now inevitably limited to a narrow range of plumage hues. Black plumage has physiological advantages, bearing in mind that heavy deposition of melanin makes the feathers less susceptible to wear and tear and that black plumage is more efficient at absorbing solar energy, which is important for maintaining body heat in lower temperatures. In addition, it is easier to see the black coloration against most backgrounds in the open areas where most of the crows live, and this brings social advantages; colourful species, such as jays and magpies, tend to live closer to the trees than crows. Bright and very conspicuous contrasting areas of plumage are frequently related to a social function, as illustrated by the pure white at the end of the tail of several Neotropical jays; the tail is moved up and down in the darkness of the forest interior as a warning of the presence of potential predators. Several of the jays and magpies possess ornate patterns, such as a highly developed crest and a long or bizarre-looking tail. No corvid has the cryptic streaked plumage pattern found commonly in passerines, although some relatively bright species, such as the green magpies, are cryptically coloured in their natural environments. Interestingly, the Common Green Magpie can lose its green plumage and "fade" to blue when kept in captivity, and this can happen even in the wild after prolonged exposure to direct sunlight. Specimens collected for scientific purposes commonly fade in similar fashion. The majority of the Corvidae have a dark or blackish bill, legs and feet.

Females tend to be duller and smaller than their respective males, but geographical variation can lead to overlap in size between the sexes when individuals from different locations are compared. In wild-living populations, pair-members tend to be about the same in size or the male appears to be the larger, but never the reverse. In a study of American Crow populations living in Saskatchewan and Alberta, in Canada, the sex of 87% of adult crows was determined by using wing length alone; if measurements of the tarsus and the head with bill are included, in addition to wing length, it was possible to reach correct sex determination in 92% of cases. Another study, of the Iberian Azure-winged Magpie, revealed sexual dimorphism in several standard measurements: weight, lengths of tail, bill, tarsus and claw of middle toe, and depth of bill. Sexual differences in postures and voice have been described for some species, and there is evidence that, for most calls, there may be differences in pitch between the two sexes.

Chicks of corvids are naked or have a very sparse amount of down at birth. The nestling down of nutcrackers is more profuse, presumably an adaptation to cold climates. Juveniles in the genera *Cyanopica*, *Nucifraga* and *Platylophus* have buff tips on the upperwing-coverts and tertials, a feature more typical of other passerine families. A juvenile plumage replaces the nestling down or follows the naked phase. The contour feathers of the juvenile plumage are usually looser and more "woolly" in texture than the adult feathers, and the wing and tail quills of juveniles are slightly weaker and shorter. Juvenile and adult plumages are similar in the majority of crows, but there are some evident exceptions; the Yucatan Jay, for example, displays striking colour differences according to the age of the individual. The iris, bill and mouth of juvenile corvids are usually different from those of the adults. The juveniles of many of the species are distinguishable for a reasonably long period, sometimes for about two years. Such differences between juvenile and adult plumages are probably related to the highly social habits of corvids, and reduce the chances of aggressive contacts. Further, it is possible that adults may find birds having immature characters less sexually attractive.

Corvids moult completely once a year, commonly after the nesting season. In the case of the Common Raven, as well as other species that fly considerable distances, the moult of the larger primaries proceeds rather slowly, so that flying ability is never impaired. Differences in the timing and duration of the moult exist among different populations of a species, especially when it has a wide latitudinal range.

Among all members of the family, the wings tend to be rounded, with ten primaries. The outermost primary is somewhat reduced, its length being 35–65% that of the longest. The Pinyon Jay has eleven secondaries, instead of ten, which is the



Birds of prey are routinely mobbed by the much more manoeuvrable corvids, even when the raptor is unlikely to present an immediate threat, as demonstrated by this ***Fan-tailed Raven*** *chasing a juvenile Black Kite* (Milvus migrans). *In more extreme cases, for instance when the raptor threatens a nest or recently fledged young, these attacks can escalate from close "buzzing" of the raptor to physical contact. Common Ravens* (Corvus corax) *have even been seen clinging to the backs of Golden Eagles* (Aquila chrysaetos), *pecking them and tugging at the feathers of their heads and necks, in order to rescue a member of the group that has been caught. Corvids will also mob birds that present no danger at all, such as the Common Kestrel* (Falco tinnunculus) *and Grey Heron* (Ardea cinerea). *They often have species-specific alert, alarm or mobbing calls, which are given with more or less intensity to indicate the proximity of the predator and seriousness of the threat. Siberian Jays* (Perisoreus infaustus) *use as many as 14 different calls when mobbing predators, providing other group members with specific information about the category of predator and, degree of risk. The alert call of an American Crow* (C. brachyrhynchos) *surprised while feeding on the ground is sharp, intense and rapid, whereas the call of a crow that catches sight of a hunter approaching at a distance is less sharp and intense, and spaced at greater intervals.*

[*Corvus rhipidurus stanleyi*, Oman. Photo: Daniele Occhiato]

pattern for the New World jays. The tail is variable, from short to very long, is often rounded, and generally consists of twelve feathers. Relatively long wings and a short, rounded tail are characteristic of several species, mostly in the genus *Corvus*, which often make fairly long, continuous and strong flights, with rather deliberate wingbeats. Ravens, which usually soar or glide for long periods, have a long and graduated tail, as well as long wings. Arboreal species, such as jays and magpies, tend to possess shorter wings, reaching only to the base of the tail, and have a more laboured flight, with more frequent wingbeats. Jays and magpies frequently have a longer tail than crows; the most extreme case is the Black-throated Magpie-jay, with an extremely elongated tail. In these instances, the function of the tail as a balancing mechanism seems no longer to be associated with the arboreal way of life, but with displays.

The bill of corvids is quite variable in size and shape, but in general it is stout, strong and fairly long, with a slight hook at the tip of the upper mandible. It is used in various ways, such as for digging in loose soil, for flicking aside earth and debris, for hammering hard food items until they break, for cracking seeds and for probing under leaves and crevices; as Marzluff and Angel mentioned, the corvid bill could be likened to a Swiss Army knife because of the versatility with which it is used. Besides this general pattern, there are corvid species which have a rather specialized bill. Examples are the long and curved bill of the choughs, which are utilized in digging and probing the surface of the ground, and the long, pointed straight bill of the nutcrackers, which has a ridge on the inside of the lower mandible enabling the bird to crack nuts open. Corvids are known to use the bill in a foraging action termed "open-billed probing", whereby the bird inserts the closed bill into a small cavity and then attempts to open it (see Food and Feeding). The New World jays possess what is known as the buttress complex, a unique configuration in the lower jaw and quadrate, that braces the partially opened lower jaw and enhances its use as a chisel; the origin of the buttress complex may be associated with the habit of acorn-eating. The nostrils are usually rounded, and are closely covered by dense bristles.

Food transportation in short or quite long flights is common among corvids, and the bill is frequently used for such purposes. Some corvids have structural adaptations for carrying food: the Rook and the Common Magpie have a large and extendable buccal cavity, the antelingual pouch, the nutcrackers have a sublingual pouch, and the jays, such as those in the genera *Cyanocitta* and *Gymnorhinus*, have an extendable oesophagus. These features enable corvids to transport conifer seeds for long distances. The Azure Jay, a Neotropical species, takes only one of the large seeds of the Parana pine (*Araucaria angustifolia*) at a time, holding the seed by its apex. The legs, instead of the bill, are sometimes employed for carrying food. For example, some crows have a habit of carrying shellfish in the feet high into the air and then dropping the food item on to a hard surface in order to break it open.

The legs and toes of corvids are sturdy. Those species with more terrestrial habits, such as the choughs, tend to have relatively longer legs in relation to their body size. The tarsus is large and strong, and is scutellated in front and booted behind, but the choughs are an exception, having smooth tarsi. Movement on the ground is usually achieved by means of one or more hops, or with a bounding gallop in which the legs leave the ground one after the other. Several species, however, walk and run, the choughs again being a good example of this.

Habitat

Corvids are found in a quite wide range of abiotic and biotic environments, occupying almost all terrestrial habitats around the world. In fact, the strong adaptative radiation of this group, constantly mentioned in the literature, makes the concept of habitat hardly applicable for several species. Corvids are found from the tropical humid forests to deserts and from the arctic zone to the mountains, such as the Himalayas. The success of this family is explained largely by its non-specialized way of life; its omnivorous habits, combined with a high cerebral capacity, which helps it to explore different food opportunities, and several particular morphological adaptations, are all undoubtedly contributing factors. Adaptability and opportunism, together with the effects of human intervention in extending suitable mixed habitats, have contributed to the historical advance and distributional expansion of several species.



Well known for their tireless mobbing of larger birds, ***Pied Crows*** *are themselves the targets of smaller birds, such as this Common Black-shouldered Kite* (Elanus caeruleus). *A few smaller corvids regularly fall victim to raptors. For example, the Eurasian Jay* (Garrulus glandarius) *is commonly taken by species such as the Northern Goshawk* (Accipiter gentilis). *However, at least one relationship with raptors seems to work to the corvid's advantage: the nests of Asian Azure-winged Magpies* (Cyanopica cyanus) *are less hidden by leaf cover when there are Japanese Sparrowhawks* (A. gularis) *residing nearby, which suggests that the magpie exploits the threat of the hawk to deter potential nest predators.*

[*Corvus albus*, Western Division, Gambia.
Photo: Dick Forsman]



This Blue-grey Gnatcatcher (Polioptila caerulea) *has good reason to mob a* ***Western Scrub-jay****, since this species is an occasional nest predator and has been identified as the major reason for the failure of Blue-grey Gnatcatcher nests in at least one nature reserve in the USA. Although often conspicuous and noisy, the Western Scrub-jay can also be furtive in its behaviour. The species is well known for attacking cats from behind, pecking their tails and escaping before the animal can turn and retaliate.*

[*Aphelocoma californica woodhouseii*, Colorado National Monument, Colorado, USA. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]

Studies have shown that some corvids can survive in harsh conditions, ranging from the long and very cold nights of higher latitudes in the Northern Hemisphere to the very high temperatures of deserts. For example, the Grey Jay, weighing 65–85 g, is one of the few small birds which are year-round residents at high latitudes of North America. A small bird has problems in maintaining basal-level metabolism during the long winter nights at higher latitudes, where the temperature may drop to minus 40°C or even lower; it needs to put on 50% of its body weight in fat each day in order not to perish during the cold nights. In these regions, however, the period of daylight available in which to feed is short, only 4–6 hours each day. The Grey Jay may save appreciable amounts of energy during the long and cold nights of the arctic winter by means of hypothermic response. It has been demonstrated that this bird's body temperature may drop at night by 4·5–6·1°C when compared with its mean daytime temperature.

Among the corvids, the genus *Corvus* is clearly the most successful in living in a variety of conditions. The Common Raven is one of the species with a wide geographical distribution, occupying various habitats, but this species avoids the interior of forest, scrub-woodland, thickets, shrubby terrain, and wetlands with tall aquatic vegetation. It is not particularly associated with human settlements; indeed, it has been considered, along with wolves and bears (Ursidae), to be a symbol of the "wild country". In contrast, the majority of the species in the genus *Corvus* live in towns and villages, or, at least, in rural and agricultural areas. Crows are common in large cities such as New York, Chicago, London, Paris or Berlin. In rural and agricultural areas around the world, several species of crow are quite characteristic in the landscape, as evidenced by the Eurasian Jackdaw, the Rook and the Carrion and Hooded Crows in Europe, the Pied Crow in Africa, the American Crow in North America, the Large-billed and Collared Crows in Asia, and the Australian Raven in Australia. Some of these species have in modern times extended into further suitable habitats with the expansion of agricultural activities. In natural conditions, crows tend to avoid the interior of forest, preferring to live in woodland edges, in riparian forest or other linear habitats adjoining open grasslands or croplands, and in open areas with scattered trees, usually below 2000 m. The Large-billed Crow, however, occurs on the Himalayan slopes up to the limit of the tree-line and beyond; mountain-climbers have reported that this species accompanied them to as high as 6400 m on the route up to Mount Everest. In deserts, the most typical *Corvus* is the Brown-necked Raven, distributed from northern Africa eastwards to Central Asia, but other species also are found in desert and in arid or semi-arid regions; these include, for example, the Fan-tailed Raven of Africa and the Middle East, the Sinaloa and Tamaulipas Crows and the Chihuahuan Raven of Mexico, and the Little Crow of Australia. In eastern North

Preening, as an essential feather maintenance activity, can take place at any time of day, and during or after activities such as feeding, fighting and copulation, when feathers become disarranged. Studies of the Tufted Jay (Cyanocorax dickeyi)*, which may form a superspecies with the* ***Plush-crested Jay****, found that several hours resting and preening occupied the middle part of the day, between two lengthy foraging bouts. One study found that New World jay species from arid areas preened less than those from forests, and did not habitually bathe.*

[*Cyanocorax chrysops chrysops*, Foz do Iguaçu, Brazil. Photo: Geneviève Vallée]





Mutual preening, or allopreening, as demonstrated by these ***Thick-billed Ravens****, is almost always directed at the head and neck, which the birds enjoying the attention cannot reach with their own bills. It also has a function in maintaining bonds between pairs and group members. Konrad Lorenz emphasizes the element of trust that must exist before a bird will allow the dagger-like bill of another raven near its eye. An appeasement display found in New World jays, and perhaps in other species, involves fluffing the feathers, while holding the bill directed downwards; the other bird responds by "peck-preening", gently pecking at the neck and face. This behaviour is also used as a greeting.*

[*Corvus crassirostris*, Ethiopia.
Photo: Jürgen Schneider]

America, the Fish Crow, in contrast, is typically found close to water, such as in marshes, both fresh and brackish, in low-lying riverine plains with scattered trees and on coastal seashores. In general, tidal estuaries, saltmarshes, inshore islands and coasts are foraging places exploited by several crows and ravens.

Although the general tendency is to avoid the interior of forests, there are several species of *Corvus* that live in forested areas, especially in the canopy. Examples are the crows of the south-west Pacific islands and New Guinea, namely the White-billed Crow, the Bougainville Crow, the Bismarck Crow, the Brown-headed Crow and the Grey Crow. Besides seeking food in the canopy, the Mariana Crow, confined to the southernmost part of the Northern Mariana Islands, is known to forage noisily in the forest understorey. Similarly, West Indian crows, such as the Palm and Cuban Crows, live in forest areas; the White-necked Crow, which is confined to Hispaniola, shuns areas that have been opened up by forest clearance.

The Common Magpie, with an extensive distribution, inhabits a wide range of open areas with scattered trees, from lowland farmland to mountains. In common with several *Corvus* species, it has recently expanded into urban areas; it has become a scavenger around human habitation, and this may have permitted its considerable expansion and successful colonization of many areas in Europe. It avoids not only large tracts of open country lacking trees but also densely forested areas. It prefers lowlands with open or lightly wooded country, offering good opportunities for foraging on the ground; the micro-climatic conditions in the foraging sites near the surface of the soil in the shadow of trees tend to suit this species. A study in Denmark showed that competition for food with Hooded Crows is a possible reason for the Common Magpie's preference for habitats near tree cover. In England, the amount of tree cover has increased in the area near Manchester, and this may explain the higher breeding densities near the city when compared with those in farmland; in addition, the magpies in Manchester prefer to nest in poplar (*Populus*) trees, because these offer some protection from predators owing to their close-knit canopy. The Black-billed Magpie occupies similar habitats, but lives also in mountainous country. A detailed study of temperature regulation of magpies in North America revealed that climate, rather than an effect of food availability, restricts the Black-billed Magpie to the "Cold Type Steppe Dry Climate"; the Yellow-billed Magpie, confined to California, tolerates warmer climates.

Humidity levels also characterize the habitats of the two species in the genus *Cyanopica*, although these two are not sympatric. The Iberian Azure-winged Magpie lives from sea-level to 700 m in Iberia, where it inhabits sand dunes overgrown with planted stone pines and eucalypts (*Eucalyptus*), and open cultivated or grass country with groups of trees and scrub, whereas the Asian Azure-winged Magpie lives in more humid habitats such as riverbanks and river islands, woodland areas and forest edge, in both mixed and deciduous forest.

Having a large geographical distribution does not necessarily mean that a species lives in a great variety of habitats. The Spotted Nutcracker, with a wide distribution in Eurasia, is closely linked with mountain coniferous forests, although it can also be found in mixed forest of conifers and birch (*Betula*); only during eruptive movements, however, is this species observed in other habitats with trees, including urban areas. Two species in the genus *Perisoreus*, likewise with relatively large geographical ranges, are typical of certain habitats; the Siberian Jay is considered an important representative of the boreal taiga in the Old World, and in the New World the Grey Jay also is typical of coniferous forest, although it sometimes occurs in areas of mixed forest. In the genus *Garrulus*, the Eurasian Jay, one of the most widely distributed of all corvids, is closely associated with forest, both mixed and deciduous, but it may occur also in conifer forests in higher latitudes, as well as in orchards and woodland areas. As with crows and magpies, the Eurasian Jay is often found in city parks and large gardens, but it is more secretive in its habits and, as a consequence, more difficult to watch.

There are several true forest-dwelling species of corvid in the Oriental Region, some of them exhibiting noticeable specialization. The genus *Crypsirina* is found commonly at the edge of lowland open forest of various types, including mixed deciduous woodland, secondary forest, bamboo and mangroves, while the Ratchet-tailed Treepie is associated more with the interior of forest, especially with extensive areas of bamboo. In the genus *Dendrocitta*, the Collared Treepie also prefers humid evergreen forest with extensive stands of bamboo. The *Dendrocitta* species, in general, live in forested areas from the lowlands up to 2600 m. Some, such as the Grey Treepie, visit

cultivation, scrub, secondary forest and ravines, but others, such as the Andaman Treepie, are more restricted to dense evergreen forest. The Rufous Treepie is the only member of this genus that is found in gardens and parks, and it seems to avoid denser forest areas, preferring both dry and moist broken deciduous woodlands. The Black Magpie, the sole member of *Platysmurus*, lives in lowland forest at up to 200 m. The green magpies, in the genus *Cissa*, and the blue magpies, in *Urocissa*, also live in tropical and subtropical evergreen forest in both lowland and hilly areas. Several species in these two genera prefer forest borders, bamboo thickets and shrubbery along watercourses, while some can be found at high altitudes, reaching the tree-limit; the Yellow-billed Blue Magpie ascends to 3600 m and the Short-tailed Green Magpie to 2400 m.

Similarly, in the Neotropics, the genus *Cyanolyca* is strongly associated with forests. Borders and secondary growth of humid luxuriant cloudforest are the typical habitats of these jays, which live in the mountains of Middle America and the Andes, commonly between 1500 m and 3000 m. Some species of *Cyanolyca* occur in elfin forest, examples being the Turquoise Jay and the White-collared Jay. The Azure-hooded Jay and the Black-throated Jay occur also in oak woodland, while the Dwarf Jay and the White-throated Jay are linked more with mixed stands of oak, pine and fir with abundant epiphytic growth.

The other genera of Neotropical jays, *Cyanocorax*, *Calocitta* and *Psilorhinus*, are less associated with tropical forests, some species being characteristic of other habitats. This is the case with the Curl-crested Jay and Azure-naped Jay, living in the Brazilian savanna type known as *cerrado*, the White-tailed Jay in mesquite forest, a type of dry forest, the Purplish-crested Jay in the Pantanal, a flooded area in south-central Brazil, the White-naped Jay in *caatinga*, a shrubby cactus steppe in north-eastern Brazil, and the San Blas Jay, found in areas of coconut palm groves. None, however, is restricted to those habitats. *Cyanocorax* jays occur also in tropical deciduous forest and evergreen rainforest; in these cases they avoid the interior of the forest, preferring watercourses in the lowlands of hilly areas, as demonstrated by the Tufted Jay, the Green Jay and the Cayenne Jay. In Amazonia, the Violaceous Jay is associated with the borders of large rivers. Besides other forest types, the Azure and Plush-crested Jays colonize the southern temperate forest, at higher altitudes in southern Brazil, where the conifer *Araucaria angustifolia* dominates and the temperature often drops to –5°C during the winter months. *Cyanocorax* species frequently visit scrub not far from forest areas, as well as riparian forest, patches of forest in open country, ravines with scattered trees, savanna in sandy soils, mangroves, and rural areas and cultivation, especially of banana, corn and coffee. Few species in this genus are reported as frequenting gardens or towns, but the Cayenne Jay, the Curl-crested Jay and the Plush-crested Jay do so. The two magpie-jays live in drier habitats, including arid bushy open country, thorn-forest, deciduous woodland and gallery forest. The Brown Jay inhabits a mosaic of habitats, having a notable preference for disturbed areas such as the edges of plantations, rather than undisturbed areas.

Among the five species of *Aphelocoma*, there are strong differences in habitat occupation. The Western Scrub-jay is the most generalist, being found throughout the mixed woodlands of oak, pine and juniper (*Juniperus*), scrublands, chaparral and brushlands



Blue Jays *bathe in shallow water by first immersing the head, then using the wings to flick water over the rest of the plumage. Although they can become regular visitors to garden bird baths, they remain wary while bathing, raising the head every few seconds to peer about, and sometimes hopping out of the water to get a better all-round view. There is a report of a Blue Jay which hopped out of the water between splashes to give an almost perfect imitation of the call of a Red-shouldered Hawk* (Buteo lineatus). *The observer suggests that this was done to keep other birds away while the jay was vulnerable.*

[*Cyanocitta cristata bromia*, Quebec, Canada. Photo: Daniel Houx]

of western North America. Less of a generalist is the Island Scrub-jay, found in chaparral dominated by low-growing oak; and likewise the Unicoloured Jay, largely restricted to humid forests of Middle America; and the Mexican Jay, living in montane pine/juniper–oak woodlands. The Florida Scrub-jay is the most specialized member of the genus, living in isolated patches of oak growing on sand ridges.

The two *Cyanocitta* species, which have relatively large geographical distributions in North America, live in mixed deciduous woodland and conifer forests, preferring borders and forest clearings. Both species frequent parks and gardens, even in cities. Steller's Jay is a quite familiar bird around camping sites and picnic spots in the Rocky Mountains, while the Blue Jay is a popular bird in urban areas of central and eastern North America. The sympatric Pinyon Jay in Arizona and New Mexico shares the dry mountain slopes and foothills dominated by pines, the scrub areas and the gardens in that region with the two species of *Cyanocitta*.

Some corvid genera of the Old World tend to live in particular specialized habitats. The choughs are found in rocky and grassy habitats in the mountains, usually up to 6000 m; the Red-billed Chough also inhabits rocky coasts and inshore islands in Britain, Ireland and north-west France. The ground-jays are typical species of desert, whether sandy or flat and stony with scattered bushes, and Stresemann's Bushcrow is restricted to a small area in southern Ethiopia consisting of acacia (*Acacia*) scrub in park-like country of short-grass savanna. The reason for the latter's confinement to so small a range is not known (see Status and Conservation). The Piapiac, with a larger geographical distribution across Africa, lives in dry savanna with scattered trees.

Although several species of corvid may live in a variety of habitats, sympatric species can exhibit clear differentiation in relation to use of the habitat. For example, where populations of the Carrion Crow and the Hooded Crow live in the alpine zone, the former selects pastures and meadows, whereas the latter prefers maize stubbles when these are available. The hybrids between these two species tend to occupy intermediate habitats. These observations suggest that the alpine hybridization zone may be a mosaic of populations differentiated in relation to the locally diverse ecological conditions. The hybrid zone seems to be dynamic, depending on variations in climatic conditions, as was shown in Scotland, where the hybrid zone has moved northwards during the last century.

General Habits

A large number of impressive observations, both in the field and in captivity, may lead one to believe that corvids are quite intelligent birds. The playing of tricks on other animals, hiding and recovering stored food both in nature and in the laboratory, the act of pulling towards themselves food hanging on a string, the ability to recognize people who are carrying guns, avoidance of trapping, the following of predators such as wolves and coyotes (*Canis latrans*) in order to obtain food, the digging of big holes under an aviary in order to escape, the habit of dropping shellfish from a height on to a hard surface in order to break them open, and the use of objects as tools are among many other equally impressive examples of the behaviour of corvids in the field and in captivity. In fact, this aura of intelligence is one of the most recognizable of endowed features of this avian family around the world.

It is true that corvids have a large head accommodating a large brain, which could explain their "mental capacities". In fact, studies have indicated that the members of the family Corvidae have a considerably larger brain in relation to their body size than other birds; only two species of parrot, namely the Red-and-green Macaw (*Ara chloroptera*) and the Blue-and-yellow Macaw (*Ara ararauna*), approach the corvid species in this respect. Furthermore, among the corvids, the American Crow is top of the list, having a larger brain than would be expected for its modest body size; the Common Raven appears in second position, followed by other *Corvus* species, and then by other genera such as *Garrulus*. In corvids and parrots (Psittacidae), the inner portion of the forebrain, especially the nidopallium, is pronounced, and is densely packed with nerve cells, making it an efficient storage, processing and co-ordinating centre. Another part of the forebrain, known as the hippocampus, may be most important in spatial memory, something which is particularly valuable when caching stored conifer seeds (see Food and Feeding). The relative brain



*This rain-bathing **Eurasian Jay** has adopted an upright but relaxed posture, bill slightly agape and crest partially raised. When anting, Eurasian Jays take up a similar position, with the wings drooping and tail and vent pressed against the ground. Unlike most passerines and other corvids that have been studied, they do not actively place the ants on their feathers, but remain passive, letting the ants run over them, although they may run their bills through their feathers. After anting, they often bathe, shaking themselves vigorously, before preening.*

[*Garrulus glandarius glandarius*, Hungary.
Photo: Markus Varesvuo]



*This sun-bathing **Steller's Jay** has raised its crest, spread its wing and tail feathers, and fluffed its body feathers to allow maximum penetration of the sun's rays. These normally wary birds have been observed sunning themselves for many minutes at a time. They take advantage of the early morning sun to warm themselves after a night's roosting, even when the surrounding temperature is below freezing. The gaping bill is characteristic of the trance-like state that many birds enter while sunning. But sunny places are also exposed places, and in contrast to some other passerines which seem to become oblivious to their surroundings while sunning, these jays remain alert, turning their heads to scan for danger.*

[*Cyanocitta stelleri stelleri*, Anchorage, Alaska, USA. Photo: Pete Morris]

size of crows and ravens is closer to that of mammals, including most primates, than to that of other birds. Marzluff and Angel commented that crows and ravens are more like "flying monkeys" than they are like other birds, meaning that they are able to learn, to remember, and to use insight in order to solve natural and experimental challenges. One can say that corvids are the creatures possessing the highest capacity for memory and learning when viewing their surroundings from the air, which gives them a tremendous advantage when it comes to surviving in different environments.

Evidence for the learning capacity and long-term memory, in this case of auditory stimuli, of corvids was provided by J. Brown, who studied dominance interactions in a colour-banded population of Mexican Jays in Arizona, in the southern USA. A whistle was blown just before food was put out for the jays; the latter rapidly learned to associate this sound with the availability of food. It was possible also to test cultural transmission of this knowledge when the observer returned some years later and performed the same procedure; yearlings and unringed migrants learned from the older and experienced individuals.

Although the highly developed mental ability of corvids may be related chiefly to food and the acquisition of it, there are other situations in which the exceptional capabilities of these birds seem to be adaptive, as illustrated in their complex social life. Since the majority of species live in flocks, memory of discrete events and fine details is important to their social life, such as in partner recognition. Another important factor in social life is individual hierarchy, which is commonly observed among the members of the flock; this subject has stimulated researchers on behaviour since the seminal study by K. Lorenz of the Eurasian Jackdaw. In captivity, the subordinate individuals must wait their turn at the food dish and must submit to having food that they have hidden stolen by other, more dominant individuals; females tend to be subordinate to males. Some researchers have suggested that hierarchy of this kind does not exist, arguing that, in reality, there would be a quick evaluation of the condition and determination of the rival. Since such hierarchy tends not to be permanent, and because of the speed at which social rank among captive corvids may change, without any physical fighting, it is suggested that these birds are competent at judging the physical and psychological condition of others. In the wild, the long-term study of the Florida Scrub-jay carried out by G. Woolfenden and J. W. Fitzpatrick offers important insights into the function of hierarchy; unlike the classical view, in which hierarchy is interpreted as being linked to intraspecific competition for limited food, dominance among Florida Scrub-jays appears to be associated with optimizing the reproduction potential of each individual. With Florida Scrub-jays, the male breeder is dominant over all other individuals in the family, male helpers dominate over all females, and the female breeder is weakly dominant over female helpers. Juve-

*Corvid songs are not well developed, but several species do have a soft, prolonged subsong. That of the **Curl-crested Jay** is a conglomeration of muted croaks, chittering and piping. A study found that New World jays uttered sounds like this, including toots, whistles, clicks, and metallic noises, with no particular pattern, and that subsongs were unique to individuals. They are performed most commonly, but not exclusively, during the courtship period, although they are often delivered when the individual is apparently beyond the hearing of other birds.*

[*Cyanocorax cristatellus*, Das Emas National Park, Goiás, Brazil. Photo: Tui de Roy/ Roving Tortoise Photos]





The most frequent call of ***Clark's Nutcracker*** *is a far-carrying, grating "kraaaa" or "kraaak", repeated several times in succession. Sometimes the call is repeated regularly and monotonously, and at other times with more variation—a long note followed by three shorter, quicker ones, for example. The calls may be uttered in duet, with pauses while the other bird, often out of sight, replies. In spring, Clark's Nutcracker delivers a more musical version of its call, perhaps the closest this species comes to a song for proclaiming a territory. Other calls associated with breeding and courtship include a succession of alternate crackles and whistles, accompanied by bowing. Despite the difference in coloration between the dove-grey Clark's Nutcracker and the dark-brown, profusely spotted Spotted Nutcracker* (Nucifraga caryocatactes)*, the two species are closely related. The Spotted Nutcracker has a similar—though brisker—version of the same call, but a quite different song, which includes a variety of whistles, plaintive dog-like whining notes, and some mimicry. Corvid repertoires can vary seasonally, and at least in the western part of its range, the Spotted Nutcracker is quite silent in the winter.*

[*Nucifraga columbiana*, USA.
Photo: Mike Read]

niles, subordinate to all other family-members, seem to establish a hierarchy among themselves by means of investigative encounters during their first summer; breeding opportunities develop in accordance with the established hierarchy among the male helpers, the dominant male helper being the first to depart and to form a pair with a female.

The communication behaviour of corvids includes numerous displays, consisting of visual and/or acoustic signals, which possibly reflect the high complexity of social organization of this bird family. Vocal communication (see Voice) is quite complex, and perhaps helps to explain the ability of corvids to count up to about six; N. S. Thompson suggested that such ability developed in corvids as a result of their vocal communication, in which different vocal messages varied only in the number of calls. Visual communication, based on displays, has been quite well studied, and shows some similarities to that of other passerine groups. Goodwin provided excellent descriptions of the displays of the Eurasian Jay. The threat display consists of an approach during which the head is held up, often with the bill pointing upwards and the plumage sleeked; snapping-together of the mandibles may also be used as a threat. Actual physical combat can occur, when the fighting jays grapple with the feet and peck with the bill, although they do not damage the opponent's eyes. In the defensive threat, when the jay is attempting to prevent a fight from developing, as during nest defence, it erects all feathers of the plumage, especially the feathers of the head and back, and points the partly opened bill in the direction of the enemy. Self-assertive display has different functions according to the context. When given by the mate, it seems to be a greeting or a means of stimulating or "backing up" the partner in the presence of mutual enemies, but in territorial contexts it is essentially a signal of defiance or hostility to the rival. In self-assertive display the corvid presents itself either frontally or laterally, with different areas of the plumage fluffed up; in sexual situations, the individual moves around the one to which it is displaying and, in the case of long-tailed species, may twist the tail towards it. Submissive display is given by the female as an invitation to coition, but it is exhibited also by individuals towards socially superior ones; it is possible that this display, sometimes called the "quivering display", first evolved as the receptive female's signal of her desire for copulation. The begging display is associated with the begging of a hungry fledgling, but females, too, perform it during the period when they are laying, incubating, or brooding young nestlings. In captivity, both sexes often beg towards humans if they are very hungry. Besides the request for food, the begging display seems to indicate dependence in relation to the human keeper or other individual. The feeding by one individual of another, usually a subordinate, is common, the latter adopting a low-intensity submissive quivering display. Among mated pairs, the male frequently feeds the female during laying, and this is an important source of food for the female.

Some of the displays described for the Eurasian Jay have been recorded also, with some variations, for other corvids. Hardy provided detailed descriptions of the displays of some species in the genus *Cyanocorax*; for the Purplish-backed Jay, for example, he mentioned that during the threat display the pupils are constricted, so that the bright yellow irides are boldly evident. Another display described by Hardy, and commonly seen in



The most frequently heard vocalization of ***Pander's Ground-jay*** *is a series of far-carrying, clear-ringing notes, "chweek chweek chweek chweek...", delivered from the top of a bush in the early morning, or, less frequently, in the evening. Poor vocalizers among non-passerines tend to have only two or three pairs of syringeal muscles. But despite their limited vocal range, examinations of corvids, mostly* Corvus *species, reveal that they have six or seven pairs, like many "true" songbirds.*

[*Podoces panderi*, SE of Lake Balkash, Kazakhstan. Photo: Per Schiermaker-Hansen]



Belonging to a recent radiation of crow species in North America, the ***Fish Crow***, *Sinaloa Crow* (Corvus sinaloae) *and Tamaulipas Crow* (C. imparatus) *are quite similar in appearance to the American Crow* (C. brachyrhynchos), *but can all be separated from this species and from one another by voice. Compared to the very varied range of calls of the American Crow, with more than 20 described, the Fish Crow's repertoire is limited. The species with the highest number of distinct calls identified is the Common Raven* (C. corax), *for which 80 calls have been documented.*

[*Corvus ossifragus*, Cambridge, Maryland, USA. Photo: George M. Jett]



The calls of ***Rooks*** *in flight over a breeding colony can vary from a flat "caw" to a high-pitched yelp. Their most frequent calls are their contact calls, and these vary individually in timbre and pitch, and are recognizable by other Rooks, particularly the bird's breeding partner. Rooks sometimes call in duet, proclaiming their territory, which can be a very small area around the nest in a crowded colony. The female's call is longer and higher-pitched than the male's. Around 20 calls have been documented for this species during the breeding season alone. These calls are used in various social contexts, and can vary in intensity according to circumstances. The Rook's "song", consisting of soft cawing, gurgling, rattling and crackling calls, has been compared to that of a loud Common Starling* (Sturnus vulgaris).

[*Corvus frugilegus frugilegus*, Rhineland-Palatinate, Germany. Photo: Mathias Schäf]



Non-breeding ***Brown-necked Ravens*** *gather noisily at roosts, which can include many foraging groups. Studies of the Common Raven* (Corvus corax) *suggest that such roosts serve as information centres, where birds can learn the whereabouts of food sources. The Brown-necked Raven's calls are much less deep and resonant than the Common Raven's, and have been likened to those of the Rook* (C. frugilegus). *Brown-necked Ravens are fairly similar in structure to Common Ravens, but significantly smaller. Larger birds typically emit lower-pitched calls because of the larger syrinx.*

[*Corvus ruficollis*, Yalooni, Oman. Photo: Hanne & Jens Eriksen]

Neotropical jays, is the "up-fluffing" of the plumage: the bird extends its neck to a greater or lesser extent and slowly erects the feathers of the neck and head, thereby revealing the pinkish skin. In a more intense form of the fluffing display, the bill is directed downwards and the head cocked slightly to one side away from the target of the display. Fluffing is a form of appeasement, being a substitute action for any tentative pecking or threat, and it has been considered to be a greeting. A positive response to the fluffing display is the peck-preening, consisting of a gentle pecking at the neck and face.

Some specific studies of spatial variation of bird displays have been carried out. Brown, studying ecogeographical variation and the aggressive behaviour of Steller's Jay, found that the increased visibility in less humid and more open environments resulted in an increased frequency of aggressive encounters. This led to the evolving of individuals with more developed crests.

Living in flocks has advantages. For example, it facilitates the discovery and maximum use of food supplies during foraging, and the pairing of unrelated individuals during reproduction, and it makes it easier for the birds to detect predators and to mob them. Nevertheless, in several situations when corvids are observed in a group, such as during migration or foraging, it is difficult to determine if the group is a genuine flock, with a higher level of cohesion among the individuals, or is simply an aggregation of individuals; in general, it is only the relationship between individuals in a pair-bond that can be easily recognized



Most treepie species are arboreal foragers, and their short legs and long tails make them clumsy in their movements when they do descend to the ground. ***Grey Treepies****, however, come to the ground frequently, where they forage by hopping with the tail cocked. The small parties of six to eight birds advance together, pecking amongst the leaf litter on the floor of the open deciduous forest they frequent.*

[*Dendrocitta formosae sinica*, Nanjing, Jiangsu, China. Photo: Li Hang]



Hooded Crows *feed by picking and probing with the bill, often leaning so far forward that the bill reaches back between their feet. They turn over stones, move sticks and straws, and push grass and weeds aside in search of small animal food, such as worms, insects, frogs, small mammals, and birds' eggs. In short grass and other terrain where prey is more easily visible, they also hunt by sight. In urban parks and playing fields they can be seen turning their heads as they stride about, and pausing frequently to examine potential food items, such as discarded sandwich crusts.*

[*Corvus cornix cornix*, Oslo, Norway. Photo: Ketil Knudsen]

for what it is. The same level of uncertainty could be said to exist with regard to territorial behaviour. In several species, individuals that are dispersed in pairs or small groups during the day may gather in a tree to pass the night together, such communal roosting behaviour being typical of many passerines. The American Crow is known to forage over large areas and to roost in aggregations during the non-breeding season, when territoriality seems not to exist; in this case, groups of four or five crows leave their stable territories each day early in the afternoon and travel to large communal roosts. Wandering American Crows, which do not maintain a territory, may be present in the same area and use the same roost-sites as those of territorial individuals. Little is known about how or why a particular site is chosen as a communal roost, but the behaviour may be continued for long periods, individuals returning day after day to the same place. In the case of the American Crow, roosts containing large numbers of individuals tend to be situated close to superabundant food supplies, while roosts with only small numbers seem to be sited so as to avoid detection by predators or to reduce heat loss. During the winter months, the Yellow-billed Magpie roosts only in dense



During the spring the ***Siberian Jay*** *feeds actively in the crowns of conifers, but in other seasons it forages much lower in the trees. It will search along branches and the main trunk, pecking at the scaly bark, before moving on to adjacent trees. This bird is taking an item of food placed in a hole in a tree by the photographer. Uniquely, the members of* Perisoreus *attach food items firmly to trees using sticky mucus in their saliva.*

[*Perisoreus infaustus infaustus*, Posio, Finland. Photo: Markus Varesvuo]



*The **Common Magpie** forages on the ground in grassland, preferring humid areas where soil invertebrates are more abundant and occur near the surface. Co-existence with other corvids is made possible by differences in foraging strategy and diet. In Granada, in southern Spain, arthropods comprise the most important animal foods in Common Magpie and Carrion Crow* (Corvus corone) *diets, whereas carrion is the most important item for the Common Raven* (C. corax). *In Denmark, competition for food with Hooded Crows* (C. cornix) *is a possible reason for the Common Magpie's preference for habitats near tree cover. Note the patch of bare, blue skin behind this bird's eye, characteristic of the North African race.*

[*Pica pica mauritanica*, Sidi Bettache, Morocco. Photo: Daniele Occhiato]

evergreen vegetation, avoiding wind exposure, thereby reducing its metabolic demand; in addition, this species displays a preference for warmer micro-habitats such as riparian forest, probably because of the moderating effect that water or moist soil may have on night-time temperatures. Having a greater tolerance of cold conditions, the Black-billed Magpie roosts in deciduous vegetation and may be exposed to lower temperatures.

Young corvids tend to follow older individuals, and the recruitment of new members at a communal roost is a common event. Therefore, in addition to the advantages of decreasing the chances of a predator's approach going unobserved, and providing some physical protection against the elements, communal roosting may, for some species, facilitate the meeting and pairing of unrelated individuals. So, the numbers of individuals in these roosting areas can be very high; in the western USA, for example, a roost of Common Ravens along 6 km of power transmission lines in Idaho attracted up to 2013 individuals. Seasonal fluctuations in the number of individuals attending the roost are typical, the total increasing in early summer and declining through the autumn. For the Eurasian Jackdaw, both residents and non-



*Although little is known about its food or feeding habits, the **Turquoise Jay** is said to forage in the subcanopy and canopy in small flocks, sometimes mixed with other species. The birds will hop along the branches, rummaging in bromeliads and other epiphytes, and stopping to peer through the foliage. This species has at times been considered conspecific with the Black-collared* (Cyanolyca armillata) *and White-collared Jays* (C. viridicyanus). *The Turquoise and Black-collared overlap, but while both are found in humid, mossy cloudforest, the Turquoise is also found in stunted elfin forest at higher altitudes. It seems to favour extensive stands of alders* (Alnus).

[*Cyanolyca turcosa*, Bellavista Cloud Forest Reserve, Ecuador. Photo: Tui de Roy/ Roving Tortoise Photos]

residents roost communally at traditional sites for most of the year; during the breeding season, however, residents tend to roost in or near their nests while non-residents often continue to use the communal site. Among the crow species living in the tropics, communal roosting is documented for the Mariana Crow.

The size and structure of corvid groups vary greatly through the course of the year. This is linked with the annual cycle of the species, in particular for those species living in temperate zones, such as the Pinyon Jay, the Eurasian Jackdaw, the Spotted Nutcracker and the Eurasian Jay. Among the Neotropical jays, the temporal variation in numbers observed in the flocks is not so great, as has been recorded for the Green Jay in Colombia.

Within flocks, individual perching distance tends to be higher for jays, which are solitary nesters, and lower for colonially nesting species such as the Eurasian Jackdaw. In jays in general, physical contact occurs only during fluffing-up of the plumage and when one individual is feeding another; in jackdaws, the pair-members habitually perch side by side, in contact with each other. Crows are intermediate in this respect, individuals perching very close to one another, but usually not in physical contact.

Several species in this family use sentinels, individuals being posted high up and in strategic positions with a good view around, from where they can warn the rest of the flock of the approach of a predator. Such behaviour has been documented especially for species living in forests, such as the Pinyon and Azure Jays; it is particularly obvious during the nesting period, at which time helpers at the nest also act as sentinels. For some species, such as the Rook and the Carrion Crow, there is some uncertainty about apparent sentinel behaviour, which could be accidental, rather than deliberate. The Rook or the Carrion Crow perched in a strategic spot perhaps flies off and emits alarm calls because of its own fear and, as a consequence, causes the others in the group, foraging on the ground, to follow it or to become alert to the danger; there are several observations, however, indicating that the foragers do not always react. Birds in larger flocks normally spend less time alert, presumably because there are more eyes to share the task, and this seems to be true of at least some corvids. During foraging on the ground, individuals of the Common Magpie vary the time of scanning behaviour, which is defined as the length of time spent in standing motionless with the bill horizontal or raised; this time tends to be shorter when the individuals are close to a protective vegetation cover. In central Texas, USA, the Western Scrub-jay is characterized as a generalist in terms of habitat selection; however, it is a specialist in one aspect alone, namely in its use of tall oak trees during sentinel behaviour.

Although corvids drink water regularly, some of the species living in arid regions, the *Podoces* ground-jays being a good example, are less dependent on this, as they obtain food having a high water content. Other species, such as the choughs, use snow as a source of water. Bathing in water and sun-bathing are regular aspects of corvid behaviour, and they are performed in a manner similar to that of other passerines. Anting has been documented for several members of the family, and is commonly followed by bathing and preening. Allopreening, the preening of one individual by another, is always concentrated on the head and upper neck, areas which the bird cannot reach with its own bill. Besides the practical aspect of removing ectoparasites, allopreening has a social function.

Species of crow that have been reared by hand from a very young age, before they are about half-feathered, usually become completely imprinted on humans and show no recognition at all of their own kind later in life. The studies by Lorenz on the imprinting and general behaviour of the Eurasian Jackdaw are famed throughout the world. Lorenz's jackdaws became sexually and socially fixated on humans. Although imprinted on man, these jackdaws responded positively to other *Corvus* species and flew with them when they were on the wing nearby; Lorenz suggested that this was an innate recognition of black corvine wings in flight. Experiments have revealed that imprinting seems more marked among crows than it is among magpies and jays; an explanation for this difference is that the former co-exist with allied species, which are similar in colour, whereas magpies and jays do not.

Corvids are active in the mobbing of predators, such as birds of prey. Even birds that present no danger, such as the Common Kestrel (*Falco tinnunculus*) and the Grey Heron (*Ardea cinerea*), are mobbed. This sense of defence of the group is common among corvids. Lorenz reported that tame Eurasian Jackdaws attacked him when he carried a pair of black swimming trunks, and he explained this as being innate predator-attacking behaviour by the jackdaws. Quantitative data on the American Crow demonstrated that the presence of a black object stimulates corvid aggressiveness towards what appear to be potential predators.

Voice

Corvids emit a wide variety of calls, but songs, which characterize other passerines, are less well developed in this family. The existence of such a range of calls is explained by the complex social organization of the Corvidae, in which social interactions





*The **New Caledonian Crow** routinely uses tools to extract beetle larvae from dead wood. These crows have been observed working hooked twigs under the larvae to lift them out of inaccessible crevices, or provoking the grubs to grab the poking stick, so that they can be hauled out. They also cut off the barbed edges of* Pandanus *leaves with their bills to create tools. The high degree of standardization suggests knowledge is transferred between crows, but they are also able to adapt their techniques to new situations. In the laboratory, one crow made a hooked tool out of wire.*

[*Corvus moneduloides*, Nouméa, New Caledonia. Photos: Alain Petit Nicolas/ Bios]





All corvids are more or less opportunistic, but the harsh, often arid habitat of the ***Brown-necked Raven*** *forces it to investigate all potential sources of food. These birds are often recorded perching on camels and donkeys, picking ectoparasites such as ticks from their heads, necks and bodies, sometimes clinging head down to reach ticks on the mammal's belly. Similar behaviour has been recorded in jays of the genus* Aphelocoma, *which regularly pick ticks and perhaps other ectoparasites from the skin of deer. House Crows* (Corvus splendens) *ride on the backs of cattle, mules and pigs, not only picking off ticks, but also pecking at sores, which prevents healing and can lead to the weakening and even death of livestock. Brown-necked Ravens also peck and aggravate sores on livestock, and will pick grain and other edible matter from animal dung.*

[*Corvus ruficollis*, Ksar Ghilane, Tunisia. Photos: Manfred Pfefferle]



The Cissa *green magpies are mainly carnivorous, with a diet that includes lizards, small frogs, snakes and birds' eggs and nestlings, beetles, crickets and mantises.* ***Common Green Magpies*** *have also been observed feeding on carrion, and may take fruit. They forage through the dense undergrowth, often in noisy mixed flocks with babblers (Timaliidae) and drongos* (Dicrurus). *They cross open ground reluctantly, moving quickly from thicket to thicket. Under cover, they may also feed on the ground, noisily turning over leaf litter, before working their way up through the shrub layer, clambering between hanging creepers, and sometimes ascending to the upper canopy.*

[*Cissa chinensis robinsoni*,
Fraser's Hill, Malaysia
Photo: Teo Nam Siang]

among individuals in a flock are constant, and in need of co-ordination. Corvids tend to live in monogamous pairs for life, and a large vocal repertoire is important for maintaining the pair-bond and in co-ordinating the partners' actions. Ornithologists studying corvid calls use a variety of words to give an acoustic impression of an astonishingly large vocal repertoire. Whistles, harsh notes, nasal calls, raucous sounds, chatters, barks, yelps, stuttering notes, and clicking and rattling notes are described, besides such expressions as rolling and resonant, deep croaking, rasping guttural notes, a buzzing quality, liquid guttural sounds, and a loquacious character. Single calls or combinations of calls are related to specific types of behaviour to determine their meaning and to develop a vocabulary, in theory. Because of the variety of sounds emitted, however, studies of the vocal repertoire of corvids are difficult, even considering all the advances in technology, such as precise video-cameras and programmes for fast sonogram analyses, that have been made in recent decades. In the Common Raven, for example, B. Heinrich stated that, despite the fact that this species' voice has received probably more attention than any other aspect of its life, he is convinced that there is no aspect of this corvid about which less is known. The Common Raven may well be the most dramatic example, since it has been recognized as having the largest vocal repertoire among the corvids.

Study of the vocal repertoires of corvids is further complicated by the fact that the unique calls emitted by a species often become blurred owing to intergradation. Distinctions between one call and another are often rather arbitrary, and sometimes alternative descriptions given by different authors studying the same species are hard to reconcile. Corvids are able to incorporate information on the degree of urgency into many calls by varying the intensity and pitch, just as humans yell more loudly and in a higher voice as they become more excited. The situation is, however, even more complex. A call may be used in different behavioural contexts, so that one specific call may be uttered in a context different from those "normally" eliciting it. There is also individual variation, frequent vocal mimicry, which may be incorporated and combined with innate calls or used instead of them, and variations due to regional differences. In fact, Marzluff and Angel highlighted the ability of crows and ravens to combine sounds in complex ways in a variety of contexts in order to vary and enrich their meaning. In view of this ability, they even went so far as to argue that corvids possess basic language skills.

Despite the problems outlined above, several authors have attempted to assessed the vocal repertoire of some species. These estimates in some cases have been qualified and in others are total counts of calls uttered. Examples in the first category are that, during the breeding season, Rooks use 20 calls and, in captivity, Red-billed Choughs use 18; in the second, that the Carrion Crow has 23 calls, the Pinyon Jay 15, the Yucatan Jay 24 and the Azure Jay 14 calls. As already noted, the species with the highest number of distinct calls is the Common Raven, for which 80 calls have been documented. One individual, however, does not emit all 80, but usually utters about 20 basic calls. It is important to bear in mind that for a considerable number of species, mostly



Corvus *crows are always ready to take advantage of an abundant food source. In springtime, in southern Manitoba, red-sided garter snakes* (Thamnophis sirtalis) *emerge in vast numbers from their underground wintering dens, forming perhaps the largest concentration of snakes in the world.* ***American Crows*** *are waiting for them! Over a ten-day period in May 1997, researchers recorded 590 red-sided garter snakes killed at or near their dens, almost all taken by American Crows. The crows inflicted injuries of several kinds, usually involving removal of the snake's liver.*

[*Corvus brachyrhynchos pascuus*,
Everglades National Park,
Florida, USA.
Photo: Hanne & Jens Eriksen]



Corvids locate food by probing with their bills, and by sight, but a series of experiments demonstrated that magpies can also use olfactory cues to smell food. Magpies frequently cache surplus fresh food, as this ***Arabian Magpie*** *appears to be doing with a small rat. In trials, magpies discovered caches of rotten chicken or bread soaked with cod-liver oil far more often than fresh chicken or plain bread. Thus, as food such as cached rodents begins to decay, it will become easier for the magpie to relocate it. Previously treated as a race of the Common Magpie* (Pica pica)*, the Arabian Magpie is now separated as a full species.*

[*Pica asirensis*, Taïf Breeding Centre, Saudi Arabia. Photo: Michel Gunther/ Bios]

from the tropics, the extent of the vocal repertoire is virtually unknown; there are few recordings of some species. Repertoires can vary seasonally. Some species are quite silent during the winter, one such example being that of the Spotted Nutcracker in at least the western parts of its range, while others are conspicuously vocal throughout the year, as typified by the choughs and the Carrion Crow.

One way in which to begin to understand the varied function of the many calls emitted by corvids is to separate the vocalizations according to their carrying capacity. Sounds that are able to carry in the environment are associated with distant communication, for example to repel or attract individuals from a territory. Sounds less able to carry are usually given when individuals are near each other. These are frequently combined with a strong visual display.

Frequently, the most characteristic call of a species is a loud one that is easily transmitted in the environment. This is, for instance, the "quork" or "crok" of the Common Raven, the "kraaah" or "aaaah" of the Carrion Crow, the "kraaaa" or "kraaaack" of Clark's Nutcracker, the "weep" of the Florida Scrub-jay, and the "jeer" or "jay" of the Blue Jay. Although behavioural ecologists generally avoid naming calls with terms indicative of their perceived function, some authors have attributed different names to these vocalizations; examples are the "assembly call" of the American Crow, the "chatter call" of the Yucatan Jay, and the "social call" of the Azure Jay. All of these calls are species-specific, and they are produced in a variety of situations where communication is usually addressed to more than one individual in the flock, as when flock-members are congregating or during foraging. Unlike some other passerines, corvids do not have an elaborate song for territory proclamation, and this loud call performs that function for territorial species. It is used, for example, to discriminate among closely related species, as in the study by L. I. Davis of North American crows, and in analyses of evolutionary relationships, as in Hardy's study of the American jays. Adult Common Ravens accompany such vocalizations with rolls or dives on closed wings in territorial defence. The Rook, the Common Raven and the American Crow may emit this call type in duet, by the two partners, when proclaiming territory. Duetting may also help in maintaining the pair-bond, as in some other bird families. In the case of the Eurasian Jay, it is possible that only males emit the "kraah" call, its function being similar to that of the duet. This call can be quite variable according to differences in motivation or behavioural context. With the Common Raven, for example, it can change from "crok" to "tork-tork", "tork-te-tork-tork" and "glonk". In the extreme, it becomes a kind of high-intensity alarm call, which may be used by a flock when mobbing a bird of prey. For the Blue Jay, Hardy mentioned, in addition to the "jay" sound, a "cleeop-cleeop" which is given with the bobbing display in low-intensity predator intimidation, as well as when challenging conspecifics in territorial skirmishes.

Corvids often have species-specific alert, alarm or mobbing calls. These vocalizations are graded and may be compounded with other calls according to the proximity of the predator or to the immediacy of the danger. Graded systems of alarm calls are

Large-billed Crows *have been found well above 5000 m in Tibet. But in winter, when the continental interior freezes, northern populations move to the milder climate and more plentiful food supplies of estuaries and coasts. In the south of its enormous range, in Malaysia and Bangladesh, it is often a bird of coastal regions, found in mangroves and around fishing ports, where the pickings for such versatile hunters and scavengers are rich. In some towns and cities, Large-billed Crows, like House Crows* (Corvus splendens)*, still play an important role in keeping the streets clean.*

[*Corvus macrorhynchos levaillantii*, Sundarbans, Bangladesh. Photo: Gertrud & Helmut Denzau]





In Seattle, USA, large groups of ***Northwestern Crows*** *have been watched as they fished systematically for Pacific sand lance* (Ammodytes hexapterus) *buried in sandy areas during very low tides. Although a valuable and predictable resource for the crows, these fish are only available during suitable tides, which occur for a few days twice a month. Northwestern Crows also collect clams from the seashore and cache them. They are short-term hoarders, and return within a few days, by which time the clam shells have opened.*

[*Corvus caurinus*, Homer, Alaska, USA. Photo: Charles W. Melton]

especially adaptive in species that live in groups, and they co-ordinate the responses of the flock-members in thwarting predators, as in the case of corvids. Marzluff and R. Balda showed that Pinyon Jays live in flocks which are conglomerates of many families, so that the relatives are in close association, and the jays quickly form a tight flock when attacked by a bird of prey, thus fitting Morton's criteria exactly. In a quantitative study of the variations in the alarm calls of the Florida Scrub-jay, a total of twelve call types or subtypes was recognized. The alert signals of the American Crow vary among individuals, and also in intensity, frequency, duration and the number of notes; the alert call of a ground-feeding individual surprised by a predator is sharp, intense and rapid, whereas that uttered by a crow that catches sight of a hunter approaching at a distance is less sharp, less intense and spaced at greater intervals. In some cases, when the predator is already close to the flock, there is a soft alert sound with almost no frequency modulation, acoustic features that make it more difficult for the predator to pinpoint the location of the caller, as in the studied case of Steller's Jay.

During foraging, soft contact calls, which appear to co-ordinate mates, family-members or group-members, are common. American Crows maintain cohesion in large groups, as, for instance, during roosting and migration, by answering each other with identical or similar contact notes, quite different from the assembly call. They also use a different announcement call to recognize and contact individuals joining a gathering, such as at feeding grounds or roosts. The contact calls of the Neotropical jays of the genus *Cyanolyca* are frequently heard as individuals



Generally arboreal, ***Red-billed Blue Magpies*** *will come to the ground especially to scavenge, where they hop about with the tail raised but drooping towards the tip. Usually found in hill forests, they have also been recorded in mangroves around Hong Kong. They are generally encountered in groups of six or seven. Although generally rather shy, and easily overlooked despite their brilliant plumage and bare parts, they can become bolder around settlements where they are accustomed to scavenge, and are also increasingly at home in wooded parks and large gardens.*

[*Urocissa erythroryncha*, China. Photo: Zhang Ming]



*In winter, some northern populations of **Hooded Crow** move to the coast, where they join others which exploit the abundant resources of the inter-tidal zone all year round. A stranded salmon has proved irresistible to this bird, despite the obvious risk from the aggressive gulls. Hooded Crows can apply intelligence, as well as boldness, when foraging: for example, in Finland, they have been seen pulling in lines left by fisherman in holes in the ice.*

[*Corvus cornix cornix*, Lokka, Finland. Photo: Markus Varesvuo]

move away from each other while proceeding in the same direction in loose flocks at different strata of the forest interior. With the Rook and the Eurasian Jackdaw, both of which breed in colonies, the contact call is the most common vocalization. Individual variation in the Rook's contact call is obvious, and is important in enabling paired adults to co-ordinate the feeding of their nestlings in rookeries (see Breeding). This is the case also for colonial Pinyon Jays. For several non-colonial breeders, however, such as the Red-billed Chough and the Iberian Azure-winged Magpie, the contact call is likewise the most common vocalization heard in the field. The Siberian Jay has a high-pitched contact call of varying strength, and this may be used also as a warning of the presence of predators, both avian and mammalian. It is evident, therefore, that it is difficult to count the number of calls considered to be contact calls in the vocal repertoire of corvids, as some of them have additional functions other than the localization of the caller.

During flock movement or in other situations, adult females are often fed by their mates. At such times, the female vibrates her wings and tail while emitting prolonged chirring calls similar to the juvenile begging call. This call type is heard also during courtship feeding prior to nesting, as well as while the female is incubating eggs or brooding chicks, when her mate presents sticks during nest construction, and when she solicits copulation. Nestlings and fledglings utter begging calls while crouched and shaking their wings to receive food from the adults. The begging calls of the female and those of the juvenile sound quite similar to each other.



*A **Common Raven**, two **Common Magpies** and a **Hooded Crow** wait their turns at a fish being eaten by a White-tailed Sea-eagle* (Haliaeetus albicilla). *The dominance hierarchy at such kills is based on size, so the raven will probably feed next, though a single raven will be unable to prevent the smaller species from picking at the carcass. Ravens cover great distances in search of food, and are usually the first species to discover carrion. Hooded Crows have been found to associate with White-tailed Sea-eagles, perhaps recognizing them as reliable providers of food.*

[*Corvus corax corax*, *Pica pica pica* and *Corvus cornix cornix*, Feldberger Lake, Mecklenburg, Germany. Photo: Bernd Zoller/ www.photolibrary.com]



*One study found the diet of the **Forest Raven** to be 31% carrion, 41% invertebrates, and 28% plant material, but this is likely to vary according to habitat, season, and competition with other corvids. Although it is the only corvid in Tasmania, it also occurs on the adjacent coast of Australia, where it meets both Little* (Corvus mellori) *and Australian Ravens* (C. coronoides). *This mainland population of the Tasmanian Raven is regarded as a relict. The Little Raven manages to co-exist with the sedentary and territorial Australian Raven by adopting a nomadic lifestyle.*

[*Corvus tasmanicus tasmanicus*, Nigretta, Victoria, Australia. Photo: Rob Drummond/ Lochman Transparencies]

Soft contact calls between individuals are difficult to study in the wild. In descriptions of the vocal repertoire, therefore, there is frequently a lack of clarity in the way in which the meaning of these calls is related. In fact, soft calls probably represent a large range of different vocalizations that is currently poorly understood outside captivity. There is some knowledge of the way in which calls vary from those in neutral or "attractive" situations to those in aggressive ones. The American Crow, for example, uses a graded threat call that varies from screams to cackles and to staccato and rattling notes while competing for perches during roosting. At Rook colonies and raven roosts, aggressive calls, including hoots, yells, trills, yacking, snarling and squalling calls, are frequently recorded. S. Hope, studying the form of Steller's Jay calls in relation to their function, found threat calls to be of low frequency and narrow range, as expected from Morton's findings. Similarly, Lorenz recognized in the vocal repertoire of the Eurasian Jackdaw a rattle call, which was associated with a warning of the approach of a predator. Individual Azure Jays in captivity emitted a rattle sound very often when others tried to steal food from their beak. Adult female Pinyon Jays do likewise when a mate sidles up too closely or when another pair attempts to steal nest material. A throaty, almost snorting , explosive "tchurch" is used by captive Common Magpies towards humans, this call being accompanied by an aggressive display and commonly being a prelude to attack. Several corvids perform bill-snapping during aggressive encounters.

In situations of appeasement or low aggressiveness, for example during fluffing or peck-preening displays (see General Habits), Hardy recorded several high-pitched vocalizations by some species in the genera *Cyanocorax* and *Cyanolyca*. Common Magpie females utter a short, soft and very high-pitched "trirr", inaudible beyond 25 m, in response to a mate which is returning, with or without food, to the nest. For the Eurasian Jay, Goodwin described "chirruping notes" in appeasement situations, especially between pair-members; these consist of a series of soft, stammering calls, with much variation in tone and inflection. Pinyon Jays emit a "rick" call, which is short and soft, probably in similar situations of low aggressiveness and between members of a pair. Clearly, the appeasement calls intergrade with calls related more to courtship, increasing the size of the vocal repertoire. Most of the calls uttered during courtship, preening, copulation and other close-contact situations probably serve to strengthen and to maintain the pair-bond.

Although corvids do not sing in the way in which most other passerines do, several species do utter a clear, complex, lengthy, soft subsong, called *sotto voce*, an Italian term related to music and frequently used by W. Brewster to describe such calls. Hardy, studying American jays, reported subsong as consisting of a complex series of different notes, usually toots, whistles, clicks, and metal sounds and others that were unique to individuals, emitted in a sequence with no apparent pattern, even for the same individual. They last for a few seconds to several minutes. Subsong does not have a territorial function, but it is most common during the courtship period. Individuals often deliver subsong alone, even outside the breeding season, in the apparent absence of any stimulus. In the case of magpies, the subsong may be related to stimulation of the female in the days prior to egg-laying. Hardy thought that, with Neotropical jays, subsong was associated with bright irides and constriction of the pupil, but it was recorded also for species having dark irides, such as the Azure Jay and the Curl-crested Jay.

Corvids mimic a variety of sounds, both natural and anthropogenic. The species can be divided into two groups according to their mimicry behaviour. Some imitate sounds mainly, but not only, when kept in captivity, the Common Raven being one such example, while others commonly indulge in mimicry in the wild, the Eurasian Jay being a good example. The Common Raven, the American Crow and the Common Magpie mimic the human voice and whistles if the individuals are sufficiently attached to humans; they also mimic other bird species and even inanimate sounds. Indeed, part of the charisma of the Common Raven is its ability to imitate the human voice, even responding with human words in appropriate situations. Goodwin suggested that mimicry may be most common in captivity because the birds have "spare time" available. Species that are frequent imitators, including the Eurasian Jay, copy many other species in the wild; this jay mimics, among others, the Carrion Crow and the Grey Heron, as well as several other species of passerine. There are several documented records of corvids imitating the calls of birds of prey, this being a characteristic particularly of the Neotropical jays, especially those in the genus *Cyanocorax*. Researchers have tentatively proposed some possible functions of this behaviour. Goodwin suggested that, for the Eurasian Jay, the utterance of a copied sound may be connected with the original emotional state aroused when the sound was first heard. Deceiving others as to the presence of a predator, or an individual's status, have also been mentioned as possible functions of mimicry. The truth is, however, that the full function of mimicry by corvids, as well as by other birds, remains mostly a matter of conjecture.



***Common Ravens** will distract vultures at a carcass by tweaking their feathers, creating an opportunity for themselves or another member of the group to grab some carrion. In the absence of a strong-jawed mammalian predator, both raven and vulture may have to wait a number of days before decomposition softens the hide of an ungulate carcass. Ravens are "shy" of carcasses, exhibiting an obvious fear of approaching them. A study of Eurasian Griffons* (Gyps fulvus)*, on the other hand, found that they seemed to need the presence of ravens at a carcass as evidence of safety, before they too would land to feed.*

[*Corvus corax hispanus*, Campo de San Pedro, Segovia, Spain. Photo: Luis Miguel Ruiz Gordón]

The vocalizations discussed above give an impression of the vocal repertoire commonly utilized by corvids, but this is just a beginning. Playback experiments have repeatedly demonstrated that calls are graded and that they convey multiple types of information simultaneously. For example, Marzluff and Balda analysed the vocal repertoire of Pinyon Jays, in both captive and wild settings, by using observation and playback of recorded calls. The contact calls, the "near" and the "kaw", caused jays to respond with the same call and to move towards the source of the sound. In contrast, the alarm call, the "multiple rack", elicited both mobbing or silent freezing by individuals. Pinyon Jays were able, however, also to recognize the identity of the caller and to temper their response to contact and alarm calls according to the identity of the jay which emitted the call. Strongest responses were given to mates, offspring and flock-members. Lesser responses were given to individuals from other flocks. Alarm calls were also of graded intensity, informing listeners of the motivation of the caller, and this led to different and appropriate responses.

Recent experimental studies of the calling behaviour of Siberian Jays, a group-living species, showed that as many as 14 different calls were used by the birds when mobbing predators. It was found that the different calls provided particular and specific information to others of the group about both the category of predator and, simultaneously, the risk posed by the predator at the time.



Recoveries and reintroductions of grey wolf (Canis lupus) *populations in North America have resulted in increased feeding opportunities for scavengers liked this **Black-billed Magpie**. Instead of waiting for deer and elk to succumb to harsh weather—which often means a long lean period followed by a glut in late winter—scavenging corvids are assured a relatively constant supply of carcasses. Common Ravens* (Corvus corax) *have been observed to associate with wolf packs, following them as they travel, feeding beside them at kills, and even, it has been claimed, leading them to prey.*

[*Pica hudsonia*, Jasper, Canada. Photo: Mark Bradley/ Boreal Nature Photos]



*In addition to its Australian range, the **Torresian Crow** is also found in New Guinea, the northern Moluccas and the eastern Lesser Sundas. Like many other corvids, it has adapted quickly to the scavenging opportunities offered by roadkill. In the Mojave Desert, USA, populations of Common Ravens* (Corvus corax) *have increased so dramatically as a result of the "food subsidy" provided by roadkill that they threaten the survival of the desert tortoise* (Gopherus agassizii). *Highway fencing, to prevent roadkill, has been proposed as a measure to reduce the raven population.*

[*Corvus orru cecilae*, Pilbara, Western Australia, Australia.
Photo: Dennis Sarson/ Lochman Transparencies]

Food and Feeding

Corvids tend to be omnivorous, taking both animal and vegetable foods. The list of food types that a species consumes can be quite impressive. For example, the Rook eats beetles of several families, including at least Scarabaeidae, Curculionidae, Carabidae and Elateridae, Lepidoptera, flies (Diptera), Orthoptera, bugs (Hemiptera), Hymenoptera, spiders (Araneae), earthworms (Oligochaeta), the eggs of vertebrates, carrion, and cereal grain and other crops, besides several other plants. From watching corvids in the wild, the observer may think that they can live on anything, but this is not the case; omnivorous behaviour has its limits, since the birds cannot utilize larger amounts of non-nutritious vegetable food than most other birds. Nevertheless, it is true that the members of this family are quite opportunistic with regard to food types, as evidenced by the Australian Raven, which opportunistically exploits nectar from flowers, and by several Neotropical species in the genus *Cyanocorax*, which prey on the nests of social wasps (Vespidae) or attend swarms of army ants (Formicidae). Corvids will also attack adults of various other bird species if they have the chance to do so. Among many published reports in the literature, some of the more interesting refer to Common Ravens killing roosting Black-legged Kittiwakes (*Rissa tridactyla*) in Alaska, a White-necked Raven attacking and killing a Superb Starling (*Lamprotornis superbus*), a Florida Scrub-jay attacking, killing and feeding on a Northern Mockingbird (*Mimus polyglottos*), a Western Scrub-jay capturing a Hermit Thrush (*Catharus guttatus*) in flight, a Steller's Jay capturing a Pygmy Nuthatch (*Sitta pygmaea*), and a Blue Jay capturing a Yellow-rumped Warbler (*Dendroica coronata*). Equally impressive was an observation made in January 2009 in southern Myanmar, where several Large-billed Crows were watched as they captured bats (Chiroptera) which emerged from a roost at dusk.

When seeking food opportunistically, corvids sometimes exploit other animals. For example, jays of the genus *Aphelocoma* regularly pick ticks (Ixodoidea) and perhaps other ectoparasites from the skin of mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginianus*). In some regions, there is a strong relationship between the wolf and the Common Raven, to the extent that it could be interpreted as a symbiotic association; evidence exists that ravens will lead predators to food, and then partake of the leftovers from kills. Heinrich mentioned that the ravens are dependent on wolves not only to kill for them and to open carcasses, but also to help them to overcome their innate suspicion of large food items; ravens, when alone, are, for reasons that are unclear, strikingly "shy" of carcasses, exhibiting an obvious fear of approaching them, but they do not show such inhibition when wolves are present. According to Heinrich, the wolves in the northern regions and, farther north, the polar bear (*Ursus maritimus*) are indispensable to the Common Raven's survival. Researchers studying wolves have reported that ravens accompany the mammals on their travels or are attracted to the howls of the wolves.



*Acorns, when they are available, probably form an important part of the diet of northern races of the **Green Jay**. This species forages in forest trees by hopping along the branches, stretching upwards to take an item from the foliage directly overhead, or hanging down to reach the branch immediately below. It rarely consumes food items immediately, but carries them in its bill to a perch, where it holds them in its feet and pecks them apart, swallowing them in small bits.*

[*Cyanocorax yncas luxuosus*, Laguna Atascosa National Wildlife Refuge, Texas, USA.
Photo: Dave Maslowski/ Maslowski Productions]



When prising pine seeds out of cones, nutcrackers either wedge them into a suitable crevice, as this ***Spotted Nutcracker*** *has done, or hold them down with the inner and middle toes of one or both feet. The seeds are then crushed in the bill, using the ridge on the inner side of the lower mandible, or, if particularly hard-shelled, held in the feet and hammered with the bill. The tree species preferred vary regionally, but typically include the local pines, as well as spruce, hazel and cedar. Spotted Nutcrackers are the main dispersers of seeds for several of their favoured trees.*

[*Nucifraga caryocatactes*, Urals, Russia. Photo: Konrad Wothe]

The corvid diet varies locally and seasonally. Seasonal variation is particularly evident for species living in temperate and arctic zones, as they frequently specialize in one food type in certain periods, so that an annual feeding cycle may be identified. The Siberian Jay, which lives in the boreal taiga, feeds mainly on insects in early spring, on berries and insects during the summer and autumn, and on seeds of conifers during the winter, having stored these seeds a few months previously, in the autumn. The Carrion Crow consumes a higher proportion of plant material, especially cereal and root crops, in autumn and winter and takes more animal prey, chiefly invertebrates, eggs, nestlings and other small vertebrates, in spring and summer; in areas with little arable agriculture in winter, its diet shows an increase in small mammals, carrion and discarded food scraps. In studies of the Eurasian Jackdaw, ants were the most important part of the animal component of the diet in three different areas of southern Spain, but were barely recorded as a food item elsewhere. For the Common Magpie, grain and fruits are important during the autumn and winter and invertebrates during the spring and summer, but various studies indicate that the proportions of specific items taken by this widespread Northern Hemisphere species differ according to region. In the Neotropics, the Azure Jay feeds mainly on the seeds of the conifer *Araucaria angustifolia* during autumn and winter, on insects during the spring, and on arthropods and fruits in summer. Even with species living in more constant and warmer climates, however, it is possible to recognize variations in the diet during the year; a detailed study in Costa Rica revealed that the White-throated Magpie-jay ate a larger proportion of caterpillars during the wet season but a greater proportion of fruits during the dry season.

Living in a large variety of habitats, corvids obtain food from varied micro-habitats or substrates. Some preferences or clear tendencies may exist, however, as in the case of the choughs in the Alps of southern Europe, which obtain their food only on the ground, or some jays of the genus *Cyanolyca* in the forests of the Andes, which forage only in the forest canopy and subcanopy. The Common Magpie forages on the ground in grasslands, but it prefers humid areas where the soil invertebrates are more abundant and occur near the surface. The Eurasian Jay forages mostly in trees during the breeding season, but outside that period it feeds mostly on the ground. During foraging, species have to face a constant conflict between gaining benefits and the risk of predation. It has been demonstrated that the local foraging choice made by the Siberian Jay is strongly influenced by the degree of predation risk.

Corvids also explore, opportunistically, more specific types of terrain. Several members of the genus *Corvus*, for example, commonly seek food on the seashore at low water. In the USA, large groups of Northwestern Crows were watched as they fished systematically for Pacific sand lances (*Ammodytes hexapterus*) buried in sandy areas during very low tides in north Seattle. Similar behaviour by Carrion Crows is a common sight in parts of northern Europe. Cultivated areas, gardens and parks are particularly attractive to certain corvids as foraging sites.

Steller's Jay *harvests the large seeds of pinyon and whitebark pine* (Pinus albicaulis)*, which it carries up to 3 km before caching them for later consumption. This species has no particular morphological adaptations for carrying food in this way, although it manages to cram up to 18 seeds into its bill at once. Jays in the genera* Cyanocitta *and* Gymnorhinus *have an extendable oesophagus to enable them to transport larger quantities of seeds.*

[*Cyanocitta stelleri stelleri*, Metchosin, British Columbia, Canada. Photo: Jukka Jantunen/ VIREO]







The problem with caching food is that it may be discovered and exploited by other birds. This ***Mexican Jay*** *has discovered the "granary tree" of a family of Acorn Woodpeckers* (Melanerpes formicivorus), *although it may struggle to remove the tightly-wedged acorns from the holes individually drilled by the woodpeckers. Mexican Jays themselves cache thousands of pine seeds and acorns every autumn, in hundreds of locations, carrying up to five seeds as a time in their bills. Because newly made caches can be robbed, corvids are reluctant to hide food if conspecifics or other species are watching them, and seldom hide large amounts of food in the same place. Remembering and recovering food from hundreds of different locations requires an extraordinary spatial memory. Development of this capacity may be a primary reason for the large brain and high intelligence of corvids. The* ***Eurasian Jay*** *is another prolific hoarder of acorns. Throughout autumn and into winter it caches up to 3000 acorns a month, burying them individually in leaf litter or beneath clumps of brambles or ferns. By the following summer, many overlooked acorns will have germinated. Eurasian Jays have learned to recognize oak seedlings, and will pull them up to get at the remains of the acorn.*

[Above: *Aphelocoma ultramarina arizonae*, Cave Creek Canyon, Arizona, USA. Dave Maslowski/ Maslowski Productions.

Below: *Garrulus glandarius glandarius*, Scandinavia. Photo: Uno Berggren/ Ardea]



*The feeding habits of the **Sichuan Jay** have been little studied. This bird may be collecting berries to cache them, although such behaviour does not appear to have been recorded in this species. The congeneric Grey Jay* (Perisoreus canadensis)*, is a prodigious hoarder of excess food, and in Alaska, a single bird may make more than 1000 caches in a single summer day, and a total of 100,000 during summer and autumn. The Sichuan Jay probably has the enlarged salivary glands which are used by the other two species in this genus to coat and stick hoarded food to the bark of trees.*

[*Perisoreus internigrans*, Sichuan, China. Photo: John & Jemi Holmes]

Although the members of this family are not specialists in their food-capturing strategies, some do at times utilize a specific technique such as flycatching or "fishing", as when they pick up floating food from the sea or an inland water. Along the river Rhine in Germany, for instance, the Carrion Crow is frequently seen to pick floating food from the water's surface. When seeking food, they may inspect any substrate in the search for nutritious material: they dig in loose soil, using a typical side-to-side flicking of the bill; they tear off loose bark; they tear apart leaves that are stuck together; and they use the technique of open-billed probing in cavities (see Morphological Aspects). This last method involves the inserting of the closed bill into a hole, crevice or rolled-up leaf and then attempting to open the bill. H. Álvarez mentioned that small corvids probably employ a greater variety of techniques for reaching food items than do larger ones, and he described the foraging strategy of a tropical species, the Green Jay. The Green Jay forages in forest trees by hopping along the branches, stretching upwards to take an item from the foliage directly overhead, or hanging down to reach the branch immediately below; it also sallies in pursuit of fleeing insects, and hovers to take food from the tips of small shrubs and ferns of the understorey. When exploring the foliage at the tips of slender branches, this jay often hangs upside-down in the manner of a parid tit or chickadee.

For sympatric species, co-existence may be possible as a result of different foraging strategies and diet, as described by Rolando and collaborators in a detailed study of the two choughs. It was found that the Yellow-billed Chough fed mainly at the ground surface, stayed at a feeding site for a relatively short time, on average 2·1 minutes, and fed quickly, taking an average of 9·2 items per minute; in contrast, the Red-billed Chough was almost exclusively an undersurface feeder, digging and probing, it stayed at a site for twice as long, 5·4 minutes, and it fed much more slowly, taking 2·2 items per minute. Having different foraging strategies, the two species of chough clearly exploited different food items, such as, for example, the particular animal matter taken during the year. In June, the Yellow-billed Choughs collected mostly cranefly larvae (Tipulidae), whereas Red-billed Choughs fed mainly on Lepidoptera larvae; from July onwards, Yellow-billed Choughs consumed mainly grasshoppers (Acrididae), while Red-billed Choughs also collected cranefly pupae, the larvae of Lepidoptera and of bibionid flies, and beetles of the families Scarabaeidae and Staphylinidae. In the Granada region of Spain, differences were detected in the food preferences of three corvid species: arthropods comprised the most important animal groups in Carrion Crow and Common Magpie diets, whereas carrion was the most important item for the Common Raven. The sympatric Azure Jay and Plush-crested Jay differ in terms of their preferred foraging strata in the forests of southern Brazil. Field observations suggest that the former prefers the canopy, which accounted for 78% of observations of foraging, and is almost never seen on the ground, while the latter is found more frequently in the middle level and the understorey, where 57% of foraging occurred, and on the ground, where 15% of foraging was done.

Several corvids are known to use inanimate objects as tools with which to reach an immediate target, in particular during feeding, something that should not be surprising in view of the large brain and considerable cognitive abilities possessed by the Corvidae (see General Habits). A Green Jay was watched as it picked up a small twig in its beak and flew to a branch of a dead tree, where it inserted the twig under a piece of bark and moved it back and forth several times; it then withdrew the twig, placing it under its feet, and proceeded to consume an insect that was attached to the twig. Even more impressively, an American Crow was seen to modify a piece of wood and then use it as a probe. The crow took a triangular piece of wood and placed it under its feet, with the wide end closest to its body, and hammered several times at the tapered end; it then picked up the piece of wood by the wide end and probed a hole, where supposedly a spider lurked, with the pointed end. In a different situation, a Fan-tailed Raven was observed to use stones in an attempt to break open an egg.

The most famous tool-using corvid, however, is the New Caledonian Crow. This species uses tools to extract the larvae of an endemic cerambycid beetle from dead wood, the technique seemingly an important part of the foraging behaviour of this crow throughout the year. Two different types of tool have been reported: a hooked-twig tool, made from a live secondary twig, has a hook-shaped wide end, and a stepped-cut tool, made by cutting out along the edges of a *Pandanus* leaf, has a jagged edge. The crow moves both tool types rapidly back and forth in order to obtain prey from the bases of leaves and holes. Tool-



In parts of its large range in central South America, the ***Purplish Jay*** *lives all year round in dry forest and scrub with little available water, so moisture-containing foods like fruit (papaya here) are important to its survival. A study in dry forest in Mato Grosso do Sul, Brazil, looked at the use made by birds of the fig* Ficus calyptroceras*, which bears abundant fruit in all months of the year. The Purplish Jay was one of the species found to increase its consumption of these figs greatly during the dry season, when other fleshy fruits and foods were unavailable.*

[*Cyanocorax cyanomelas*, Caiman Ecological Refuge, Pantanal, Brazil. Photo: Mark Jones/Roving Tortoise Photos]

making by New Caledonian Crows has three features: a high degree of standardization, distinctly discrete tool types with definite imposition of form in tool-shaping, and the use of hooks. Recent laboratory experiments with one individual showed that this species did not mechanically apply previously learnt movements to new situations, but, instead, sought a new solution to each problem presented.

Tools may be used by corvids for purposes other than that of obtaining food. Encounters among different species near a common food source, such as a feeding platform, often produce aggression. There is an amazing reported case in which corvids used a stick in a weapon-like way during an aggressive interaction. After repeatedly failing in its attempts to drive an American Crow from a feeding platform by scolding, approaching and diving at it, a Steller's Jay flew into a nearby bush, where it worked vigorously to break off part of a small branch. Having broken off the twig, the jay, holding the stick in its bill, approached the crow and thrust the pointed stick at it. The crow lunged at the jay, which then dropped the stick, whereupon the crow picked it up and flew after the jay.



Confined to the Tumbesian ecoregion, the semi-arid Pacific slopes and lowlands of south-west Ecuador and north-west Peru, the ***White-tailed Jay*** *is associated particularly with mesquite woodland and shrubby cactus steppe. Examinations of its stomach contents have revealed its diet to consist of beetles, ants and other insects and seeds, supplemented by birds' eggs. The bird in the picture appears to be eating the flesh, rather than the seeds, of this prickly pear* (Opuntia). *The fleshy fruit is perhaps a source of moisture in an area which relies on the El Niño Southern Oscillation for its rare and irregular rainfall.*

[*Cyanocorax mystacalis*, Chaparri Ecological Reserve, Peru. Photo: Heinz Plenge]

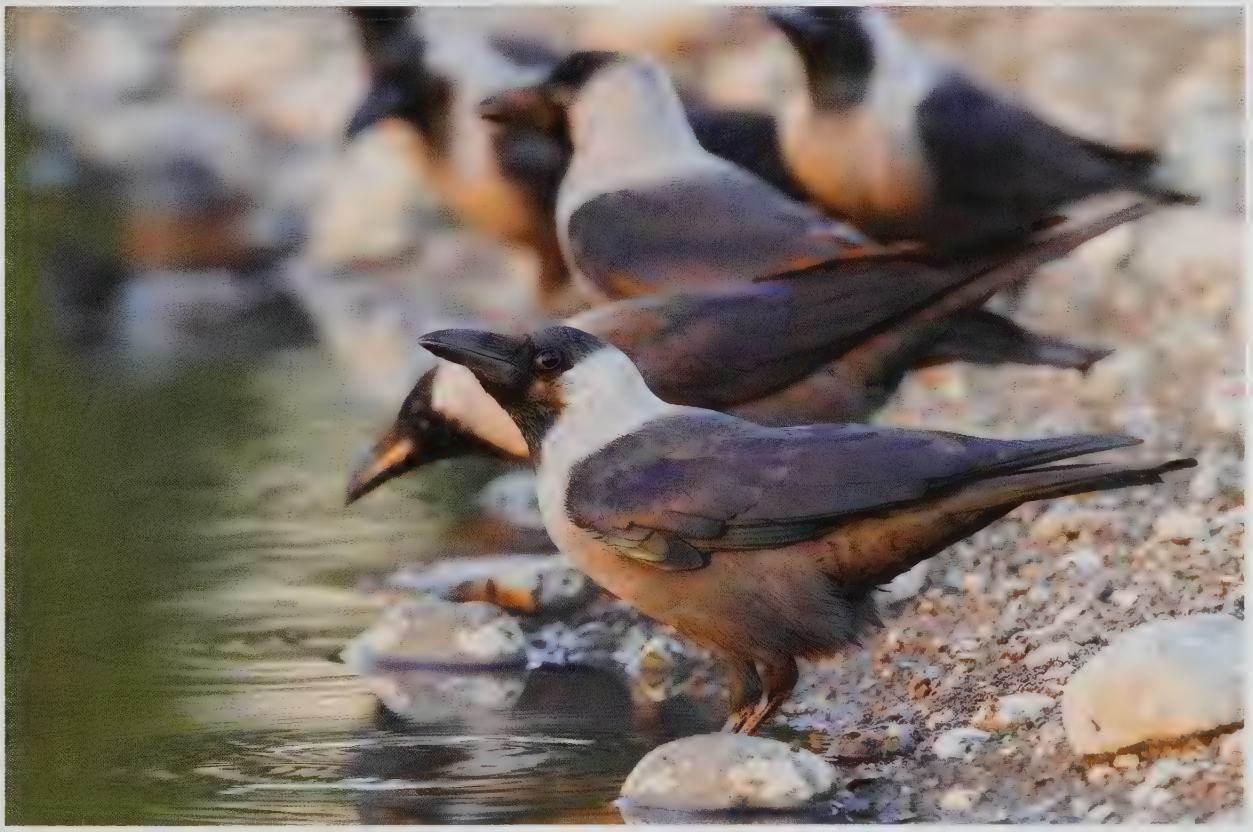
When dealing with food that needs to be opened, such as conifer seeds, the corvid holds down the item under the inner and middle toes of one or both feet and uses its bill to tear, bite or hammer it. Nutcrackers are the most specialized corvids in opening conifer seeds. Clark's Nutcracker employs two methods of hulling, or dehusking, to open pinyon pine seeds. One method is that of crushing, whereby the bird squeezes and cracks the seed husk and separates it from the endosperm while holding the seed in the bill; the other involves pounding, when it holds a seed between the feet and perch and pounds it forcefully with the bill until the husk cracks. It is reported that seeds that were pounded were significantly wider and had a thicker husk than those crushed. Clark's Nutcracker, a species highly skilled in handling pine seeds, assesses the most appropriate hulling method by testing the seed in its bill; hulling seeds by pounding them usually took 2·5 times longer than the time taken to dehusk them by crushing. Pinyon Jays, which have a relatively narrow bill, do not open the thick-coated pine seeds by the crushing technique, but only by pounding them. It has been stated that the crushing technique could allow birds to remain attentive to their surroundings, which is important for a non-social species such as Clark's Nutcracker; for the social jays such as the Pinyon Jay, with a well-developed sentinel behaviour (see General Habits), crushing is not of such great importance. Sympatric species, but less specialized in exploiting the pinyon pine, Steller's Jay and the Western Scrub-jay do not have a sharp and pointed bill, and consequently, unlike Clark's Nutcracker and the Pinyon Jay, they cannot open the closed cones in which the seeds are set; they obtain the seeds only from previously opened cones or by kleptoparasitizing nutcrackers.



*The **Grey Jay** becomes bold and tame in regular proximity to humans. It will visit bird tables, steal pet food, haunt picnic and camp sites and will even, as shown here, take food from the hand. The long-standing association between many corvid species and humans is partly the result of their ability to accustom themselves to novel, processed foodstuffs, beginning with bread, and extending to modern innovations such as breakfast cereal. The Grey Jay's opportunism was a source of frustration to early trappers, who found that the birds learned to follow them and steal the bait from their traps.*

[*Perisoreus canadensis canadensis*, Ontario, Canada. Photo: Adrian & Jane Binns/VIREO]

Food-storing is a very common aspect of behaviour among corvids, and occurs when an individual has more food available that it is able to consume at the time. It makes use of the store during periods of food scarcity, thereby gaining a fitness advantage. The ability of seeds to remain dormant makes them particularly suitable for storing, but any item can be stored, especially if it is of a kind that will remain edible for some time. Typical crows in the genus *Corvus*, and possibly *Pica* magpies, do not depend on stored food for their survival during the harsher months of the year. Whereas long-term hoarders, such as some species of jay and nutcracker, are dependent on stores because of the seasonal fluctuations in their food abundance, short-term hoarders, for instance several crows and magpies, use food caches to counter fluctuations caused by variable weather or fluctuations in prey availability in the course of the day. Seeds of conifers are an example of food items stored by a long-term hoarder such as the Eurasian Jay, while clams (Mollusca), which are protected by their shells and remain closed for up to two days, are an example of food stored by a short-term hoarder, the Northwestern Crow. In a study investigating the ancestral state of caching behaviour by corvids, it was found that the ancestor was probably a moderate



*Most corvids need to drink regularly, and so provision of artificial water sources in arid areas can help them to extend their ranges. The spread of the **House Crow** into the Middle East has been greatly assisted by the development of irrigated agriculture, and also, in Israel, by the construction of fishponds. In urban areas these aggressively adaptable birds can also be found drinking from garden ponds and even swimming pools.*

[*Corvus splendens*, Oman. Photo: Daniele Occhiato]



Species that spend the winter in snowy climates, such as choughs (Pyrrhocorax) *and* ***Blue Jays****, can satisfy their water requirements when the usual sources are frozen by eating snow. Clark's Nutcracker* (Nucifraga columbiana) *makes a different use of snow, burying its caches of pine seeds in places which lose their snow cover at different times in the spring. This provides it with a steady supply of food which is hidden from competitors such as other jays and rodents until the bird is ready to use it. Its nestlings are raised almost exclusively on pine seeds from these surviving caches.*

[*Cyanocitta cristata bromia*, Quebec, Canada. Photo: Daniel Houx]

cacher. In addition, it was suggested in that study that differences in the degree of adaptation to food-caching are due to a bi-directional evolutionary trajectory in this behaviour.

The storing of conifer seeds during the autumn seems crucial to the winter survival of long-term hoarders, such as the Pinyon Jay and Clark's Nutcracker in the temperate zone and the Siberian Jay in the boreal zone. Unfortunately, there are few quantitative data to show that the stored food really is crucial for the survival of these species during periods of food scarcity. The only evidence is of an indirect nature; for the Pinyon Jay, for example, cached pine seeds make up to 70–90% of the winter diet.

Seeds are often stored in or on the ground, the bird raking or pulling over adjacent soil or vegetation with sideways movements of the bill, concealing the food from sight. It may also place one or more stones, leaves or other objects on top of the stored food, probably in an attempt to camouflage the store. Corvids tend to be reluctant to hide food if conspecifics and/or other species are watching them because newly made caches are more likely to be robbed. In fact, they tend to be fairly secretive when hoarding food, presumably to avoid the attentions of competitors. Clark's Nutcracker uses a number of different cache sites that become free of snow at different times in the spring; this behaviour, supposedly, is designed to protect the stores from competitors such as, for example, rodents, which cannot reach caches buried under deep snow. The Grey Jay uses its own sticky saliva in forming food balls, which it then sticks to various parts of trees; the food becomes securely fixed in position, and requires forceful extraction, a feat beyond the capability of a small pilferer. Corvids



In courtship displays, the male ***Pied Crow*** *struts around the female with the plumage of the nape and throat fluffed out, and the bill lowered. Corvid courtship may also include bowing, accompanied by rattling calls. The female responds with a submissive display, crouching and quivering her wings, a typical invitation to coition among passerines. Among the Corvidae, these displays have been most extensively studied in the Eurasian Jay* (Garrulus glandarius).

[*Corvus albus*, Simien Mountains National Park, Ethiopia. Photo: Elio Della Ferrera/ naturepl.com]



The rolling and tumbling aerial displays of ***Common Ravens*** *have a number of functions, some related to territorial defence and courtship. The elements of the display—including a roll with closed wings directly over the territory—probably convey information to the partner, as well as reinforcing the pair-bond. A pair will also fly in loops over their territory, their turns and wingbeats perfectly synchronized. Sometimes, particularly in snow, the birds tumble to the ground, where they continue to roll and sprawl, their claws extended to one another.*

[*Corvus corax hispanus*, Salamanca, Spain. Photo: Alejandro Torés]

very seldom hide a large number of food items in exactly the same place, but flocks of specialized species use caching sites inside their home range.

In a detailed study in northern Arizona, Marzluff and Balda reported that the Pinyon Jay's activity for 2–3 months in the autumn consists largely of the harvesting of pinyon pine seeds and transporting them to a caching area, which is about 4 ha in size. Flocks can fly up to 7 km to reach the caching area. In each trip, each Pinyon Jay can carry about 38 seeds in its extendable oesophagus. The capacity to carry seeds seems to be proportional to the distance over which a species transports food. Clark's Nutcracker has a special morphological structure known as the sublingual pouch (see Morphological Aspects), which can hold 90 pinyon pine seeds, and this species, being a stronger flier than the Pinyon Jay, may carry the seeds up to 22 km. Steller's Jay, which does not possess any special morphological feature for seed-carrying, transports as many as 18 pine seeds on each flight, which may cover a distance of up to 3 km.

Stored food has to be recovered after a certain period of time. Several corvids have been shown to possess an extraordinary power of spatial memory with regard to the retrieval of cached food; they may hide food in hundreds or thousands of sites for periods of days or months, and then relocate a large proportion of these. Some of the species have been found to have an efficiency rate of 60–90% in recovering stored conifer seeds in excavations made through the snow. In aviary experiments, Pinyon Jays arranged their caches spatially in clumps, which proved to be more efficient for successful retrieval than was the case when the seeds were widely dispersed. In another, similar experiment, however, Clark's Nutcrackers did not clump their caches in this way but, instead, spaced them out, which suggests a more highly developed spatial memory; apparently, the nutcracker remembers the exact place where it stored each seed. This exceptionally well-developed power of spatial memory of food-hoarding species is related to the fact that the hippocampus in the brain is larger than that of non-hoarding birds. Indeed, not only is a larger hippocampus related to the spatial memory but so, too, is a variety of associated brain regions and synaptic connections. The simultaneous evolution of these neural substrates and the behaviour of food-hoarding may result in an increase in size of the entire brain.

Relocation of food by means of olfaction seems unlikely for a bird storing seeds, but data on Northwestern Crows suggest that olfactory cues may help in this process. In the case of both the Rook and the Carrion Crow, the recovery patterns for stored acorns suggest a memory only for the general area of hoarding. These two species were seen to search for caches particularly on cold days in late winter, when the calorific value of recovered acorns exceeded that of other available food, but their efficiency in recovering stored seeds seems less than that of other species, recovery apparently occurring by chance.

In any case, a proportion of seeds hidden in the ground is never recovered, which means that corvids are potential dispersers of seeds. Studies on corvids as seed-dispersers are quite detailed with regard to the relationship between Clark's Nutcracker and various species of pine, between the Pinyon Jay and the common pinyon (*Pinus edulis*), between the Blue Jay and the pin oak (*Quercus palustris*), and between the Eurasian Jay and species in the beech family (Fagaceae). Several authors have suggested that the northward spread of certain tree species after the last glaciation might be due to seed-hoarding corvids. For example, such behaviour by the Blue Jay could help to explain how *Quercus* spread northwards; it is believed that morphological adaptations of the trees facilitate efficient exploitation by birds that act as seed-dispersers. In laboratory experiments in which nuts and acorns of five North American tree species were used, it was suggested that Blue Jays, although showing a preference for small seeds not having a hard outer covering, may exploit a wider variety of seeds according to availability, thereby contributing to the dispersal of all species of the Fagaceae.

In the laboratory, the Blue Jay and the Western Scrub-jay were unable to subsist solely on acorns. This was attributed to the relatively high concentration in acorns of secondary compounds known as tannins, which inhibit protein digestion. It seems, therefore, that jays do not possess physiological adaptations for countering the protein-binding properties of the tannins. It is suggested that, in nature, it is quite important that the jays consume high-protein foods in conjunction with acorns; without sufficient mixing of high-protein foods with the consumption of tannin, dietary protein from acorns and perhaps the digestive enzymes in the bird may be effectively bound, resulting in the near-total negation of nutritional benefit. This mutualistic interaction between corvids and plants, whereby changes in the parties involved act reciprocally as selection pressures on one another and lead to increased fitness for both, has been interpreted as co-evolution.



*This male **White-necked Raven** is feeding the female as part of a courtship ritual. Later he will regularly provision his mate on the nest. During courtship feeding, the female begs by vibrating her wings and tail, while giving prolonged chirring calls similar to the juvenile begging call. In corvids, the male responds by placing the food into her mouth. In some other families, such as finches (Fringillidae), the male regurgitates the food into the female's mouth. Male Herring Gulls* (Larus argentatus) *present the female with the food offering by regurgitating it onto the ground in front of her.*

[*Corvus albicollis*, Virunga National Park, Democratic Republic of Congo.
Photo: Konrad Wothe]

Clark's Nutcracker and the whitebark pine have shared a strong mutualist co-evolutionary history, which has shaped the morphology and mental capacity of the bird and determined the distribution and genetic structure of the pine. As mentioned previously (see Systematics), an ancestor of Clark's Nutcracker crossed the Bering land-bridge from Siberia probably after the ancestor of the New World jays of such genera as *Cyanolyca*, *Cyanocorax*, *Calocitta*, *Psilorhinus*, *Cyanocitta*, *Gymnorhinus* and *Aphelocoma*. This scenario is consistent with the lack of subspecific differentiation in Clark's Nutcracker and genetic evidence that the whitebark pine also crossed into North America recently; the strong co-evolutionary history of the jay and the pine genus *Pinus* facilitated the dispersal of the latter in North America. The earlier colonization of North America by the New World jays, which also contributed strongly to the dispersal of other species of *Pinus*, should have benefited the nutcracker by creating an increased area of available food. Some Neotropical jay and magpies species, namely those in the respective genera *Cyanocorax* and *Calocitta*, are known to hide food on the ground or in the branches of trees, but they do not rely on this stored food in the wild, since the availability of food resources in their environments is much more constant through the year. It is hypothesized that such behaviour could be a relict from their ancestors.



*This **Unicoloured Jay** is collecting rootlets to line its nest. The main bowl of the nest is built from short, relatively thick twigs, commonly oak* (Quercus) *twigs, 2–5 mm in diameter and some 35 mm long. The nest is placed in an oak, pine or madrona* (Arbutus) *tree, either in the crown or where a major limb meets the trunk, at a height of 5·5–13·5 m. Unicoloured Jays live in territorial groups including a female breeder, a primary male, and a number of less dominant males and females. This species is unusual in that the "secondary" birds join the primary ones in nest-building.*

[*Aphelocoma unicolor unicolor*, Guatemala.
Photo: Samuel Hansson]



Pica *magpies are relatively unusual among the Corvidae in building domed nests. These bulky structures consist of a loose outer shell of hefty, often thorny twigs, surrounding a nest bowl made of mud or dung and lined with grass, rootlets, animal hair and feathers. The Black-billed Magpie* (P. hudsonia) *was until very recently treated as a race of the* ***Common Magpie****, but the two forms differ in nest spacing and territoriality. Common Magpies defend territories of about 5 ha, with nests regularly spaced. Black-billed Magpies either exhibit no territorial defence, or defend an area of about 0·3 ha around their nests.*

[*Pica pica pica*, Rhineland-Palatinate, Germany. Photo: Mathias Schäf]

Food-storing behaviour favours sedentary and territorial habits, since the individual should retrieve the stored food. It therefore has implications for the social organization of the species doing the caching. Residency in the breeding area during the winter may confer a reproductive advantage, and food-storing may enable birds to survive the winter in areas in which they would otherwise have succumbed. Nevertheless, there are records of migration by corvids that store food during the winter, such as the Blue Jay and the Spotted Nutcracker; it has been suggested that these corvids retrieve the stored food when they return in spring. The Pinyon Jay is resident when storable food is plentiful, but it migrates when the food crop fails.

The availability of pinyon seeds accelerated gonadal growth in the Pinyon Jay and thus, together with photoperiod, acted as a proximal timer for breeding. Stored food enables Clark's Nutcracker and the Pinyon Jay to begin breeding in winter conditions, earlier than other corvid species such as the Western Scrub-jay and Steller's Jay, which are dependent on animal food for the rearing of a brood. The advantages of early breeding are that there are fewer parasites in the nest during winter, that more time is available for the young to gain weight and develop feeding skills, and that early-fledged young become dominant over late-fledged ones; but early breeding seems also to be a necessity for the hoarding species, since adults must be free from parental du-



Iberian Azure-winged Magpies *are social breeders, their nests forming loose colonies, but rarely with more than one nest in a single tree. The female does most of the nest-building, although the male brings material to the site, and "helpers", presumed to be young from the previous year, often participate. The nest-site is 3–7 m above the ground in a fork in an outer branch, as far as possible from the main trunk. Asian Azure-winged Magpie* (Cyanopica cyanus) *nests, by contrast, are frequently domed, and often placed in tree hollows. They are rarely more than 2 m up, and sometimes actually built on the ground.*

[*Cyanopica cooki*, Portugal. Photo: M. D. England/ Ardea]



The blue magpies include both social breeders like the Taiwan Blue Magpie (Urocissa caerulea)*, and others, like the* ***Sri Lanka Blue Magpie****, which are assumed to be solitary breeders. Information on the breeding of the Sri Lanka Blue Magpie is scant, but like others in its genus, it probably involves helpers, presumably non-breeding young from the previous year. The photographers describe this picture as showing three adults tending recently hatched chicks. Co-operative breeding, which can take many forms, is largely confined to corvids with a southerly distribution. The ancestors of the Corvidae are thought to have been co-operative breeders.*

[*Urocissa ornata*,
Sri Lanka.
Photo: Andy & Gill Swash/
WorldWildlifeImages.com]

ties to begin storing food, and juveniles must be able to make their own stores. Food stored before the reproductive season either is used during the breeding period by the parents themselves or is fed to the nestlings. Nestlings are dependent on stored food to different extents. For example, nestlings of Clark's Nutcrackers are raised almost exclusively on pine seeds from the parents' caches, whereas only 9% of the nestling food of Pinyon Jays consists of conifer seeds, and Eurasian Jay nestlings are fed with hoarded acorns either occasionally or not at all. It is thought that stored food represents a positive benefit for reproduction; in studies of the Northwestern Crow, there was a drastic reduction in the female's nest attendance when the cached food was removed, and this may lead to lower breeding success.

Breeding

There are some reasonably long-term studies of the breeding behaviour of several species of corvid, and these have revealed great variation in social organization within the family, sometimes with strong variations within a single genus, or even within the same species in different regions. Such a wide variety of breeding sys-



The ***Australian Raven*** *is a solitary and non-co-operative breeder, on a continent with more than its share of co-operatively breeding bird families related to the Corvidae. Its nest, a large bowl of sticks lined with fibrous bark, animal hair and wool, is placed at the top of the highest tree or artificial structure (telegraph pole, windmill or pylon) in its territory. In the absence of even a large shrub, it may build on the ground, usually leaning its nest against an object such as a fence post.*

[*Corvus coronoides coronoides*,
Geelong, Victoria,
Australia.
Photo: Peter Fuller]

tems is frequently explained as being an influence of habitat, although recent studies seem not to corroborate this for some species. In fact, studies of the breeding systems of corvids have become quite detailed, and this has been important in the development of theories on the evolution of altruism and co-operative breeding by birds, and an additional stimulus for researchers since the 1970s. On the other hand, knowledge of the reproductive behaviour of some tropical corvid species is based mainly on sporadic reports.

Corvids tend to be monogamous, with a strong pair-bond usually sustained during the year, and frequently during the life of the individuals concerned. For the Florida Scrub-jay the "divorce" rate is only about 5%, and the bond is broken primarily when one partner becomes temporarily or permanently incapacitated and is replaced. It has been demonstrated that long periods of fidelity lead to increased breeding success. The Mexican Jay, in its extremely complex breeding system, exhibits variations from monogamy, the system used in most situations, to polygynandry, with multiple breeding males and breeding females in one social group.

A detailed study of a Pinyon Jay population revealed some pairing patterns. Within the pair, partners were of the same age but were not necessarily comparable in terms of bill length and body weight. Assortative pairing for age may be favoured because similar-aged partners produced slightly more young than dissimilar-aged ones, and their young survived for longer than those from dissimilar-aged pairings. It is possible that similarity in age may promote increased fecundity by ensuring that the partners are compatible. Pairs consisting of a heavy female and a light male lived for longer and were more successful in producing offspring compared with partners of other size categories. This may have been due to the fact that small males did not completely dominate large females, so that aggressive encounters were less frequent.

The social organization of corvids includes defence of an all-purpose territory by a pair or by a flock. In the latter case co-operative breeding may occur, an area then being defended by a flock, usually a familial flock, in which non-breeding helpers are present. Helpers may assist in nest-building, in feeding the incubating female, and in caring for the young. Habitat use and the concept of ecological constraints have played a major role in the development of theories concerning the evolution and maintenance of co-operative breeding by birds. In the Corvidae, co-operative breeding is strongly correlated to latitude, and its predominance in species with a southerly distribution indicates a secondary evolution of co-operative breeding in the lineage leading away from the basal corvids. Some species of corvid are colonial breeders, pairs placing their nests very close to one another, sometimes in one large tree, and even with several nests on the same branch; the territory is then no more than a tiny area around the nest. Variations of those three basic systems may exist, however, with gradients, for example, between territorial and colonial.

The American jays, in particular, exhibit an impressive variety of social organization, with different levels of sociality. Brown proposed that the origin of sociality in jays is the delayed dispersal in the all-purpose territory. According to Brown, Steller's Jay would represent a first step towards the colonial system. This species maintains an area of dominance around the nest which is not a territory as strictly defined, but which results from aggressive competition; home ranges overlap significantly, individuals extending their foraging range far into the home range of others. This system provides some advantages of flocking, such as the finding of temporary rich food resources and the detecting of predators, without the susceptibility to predation that is typical of clumped nests. Steller's Jay is not colonial, as its nests are spaced by means of the area of dominance, but the circumstances favour the development of coloniality. The Blue Jay presents the same system as Steller's Jay, but its home ranges seem to overlap less. For both of these jays, a dominance rank and good reproductive success may be expected; this is achieved by means of the complete suppression of breeding by subordinates in the home range.

Among the American jays, there is probably only one species, the Pinyon Jay, that is truly colonial. Nests of this jay are clumped, a defended individual distance being apparently non-existent, so there is no defence against other colony-members. In the colonial system of the Pinyon Jay, there are no helpers at the nest for the first two weeks after hatching, but a few adults, although no first-year birds, may sometimes contribute helping activities during the last four or five days of the nestling period; after the young have fledged, helping activities increase. During the autumn, Pinyon Jays are highly gregarious. The long-term study of the Pinyon Jay carried out in Flagstaff, in Arizona, by Marzluff and Balda showed that the rather large autumn flocks, containing an average of 190 individuals, consist of many



Eurasian Jackdaws *are frequently seen taking hair from live animals to line their nests. Sometimes several birds will perch on the same horse (as here), sheep or deer. The mammals, perhaps used to having ticks removed by corvids, appear remarkably tolerant of the often vigorous tugging. Males will continue to bring this and other nest materials after the female has begun to incubate. Jackdaw nests are very variable in size and structure, depending on the nest cavity. In a deep hole, such as a chimney, sticks will be thrown in until enough of them lodge to form a firm foundation.*

[*Corvus monedula monedula*, Scandinavia. Photo: Uno Berggren/ Ardea]



***Rooks** are highly gregarious and colonial, nesting close together in the tops of tall trees, often with numerous nests in the same tree. Each pair defends a very small territory around the nest. Theft of twigs is common, some pairs obtaining up to 30% of their nest material from their temporarily absent neighbours. Although essentially monogamous, at least some male Rooks are promiscuous, and younger females in particular have been found to mate with one or more of them in addition to their partners.*

[*Corvus frugilegus frugilegus*, Germany. Photo: Günter Ziesler]

small clans of related jays; clans are extended families consisting of two or three generations of parents. New genes are brought to the flocks through the immigration of individuals; in a studied flock in Arizona, 36% of individuals were immigrants. In a colonial system such as this, the feeding area is shared with many other individuals; the population expansion occurs mainly through colony growth.

The Florida Scrub-jay is an example of co-operative breeding in which pairs retain ownership and sole breeding privileges in one territory year after year. Detailed findings are available for this species from a long-term study, carried out over several decades by Woolfenden and Fitzpatrick in central Florida, based on hundreds of ringed individuals of a population living in the Archbold Biological Station. Nearly all yearlings remain as helpers in their natal territories; a pair may have up to six helpers, but half of the breeding pairs had no helpers at all. Helpers assist the breeding pair in all territorial and breeding activities except those of nest construction, egg-laying and incubation. The Florida Scrub-jay occupies only the botanically distinct Florida oak scrub, a rare and scattered habitat. All available habitat of this type is constantly occupied by this species, various measures having shown the habitat to be densely crowded with breeding birds. Mature, non-breeding individuals are present in many territories, so that every new breeding space is immediately filled. Working together, members of a pair defend a relatively small territory, of 9 ha on average, throughout the year. With a surplus of jays always competing for breeding space, in a habitat in which physical territorial defence is relatively easy, the benefit-to-cost ratio of strong territorial defence clearly favours its existence among breeding Florida Scrub-jays. A pair without helpers, defending only enough space in which to survive and reproduce, cannot win in competition with pairs that defend sufficient extra land to provide a core for the future generations' territories, particularly when some birds are able to expand their territories through the additional efforts of helpers. In such a system, parents provide for their offspring, including ones yet unborn, by defending a greater area than they themselves need. Offspring improve their own fitness by adding to the landholdings, which increases both their opportunities to inherit space and the ease with which they can safely disperse to a neighbouring territory to fill a vacancy. Helping beyond the age of two years is of infrequent occurrence, especially among females, but a few males have helped for up to six years before beginning themselves to breed. Pairing is commonest at or near the age of two years, females pairing significantly earlier in their lives than males. Florida Scrub-jay helpers obtain breeding space by any one of four methods: through mate replacement in a territory outside their natal one; by what is known as "territorial budding", whereby a male, paired with an immigrant female, inherits a portion of his natal territory; through direct inheritance of the natal territory following the death of a breeder; and by establishing a territory between existing ones. About 56% of breeding males obtain a breeding space by means of some form of territorial inheritance, while some 94% of breeding females pair outside their natal territory. The Florida Scrub-jay's helper system can be viewed as a combination of strategies in which dispersal is delayed until a breeding vacancy can be located outside the natal territory or be created within it; such a system would be suitable in sharply bounded habitats that are saturated with long-lived breeders.

In California, the closely related Island Scrub-jay, confined to Santa Cruz Island, also has to acquire a breeding space, these being similarly in short supply, and young or subordinate individuals must delay reproduction for several years until they are able to acquire a suitable nesting territory. On Santa Cruz, however, the young do not remain on their natal territories or act as helpers, but, instead, they wander along the peripheries of established territories and suboptimal habitats until a breeding space can be acquired. These young individuals, termed "floaters", may survive in areas that are unsuitable for breeding territories, whereas such "marginal" habitats are less available for the Florida Scrub-jay.

Also closely related to the Florida Scrub-jay, the Western Scrub-jay exhibits variations in its breeding system. In California, territories are defended only by the breeding pairs, but in the mountains of northern Oaxaca, in south Mexico, flocks defend territories or help in the defence of them, although non-breeders have not been seen to feed nestlings. The population living in Oaxaca does not corroborate the notion that habitat saturation favours co-operative breeding, as had previously been observed for the Florida Scrub-jay, because available habitat is plentiful in Oaxaca but scarce in California.

In the case of the Mexican Jay, delayed reproduction and reduced dispersal are carried to an extreme. The young remain with



Jackdaws differ from all other species in the genus Corvus *by nesting in cavities. In open wooded country, farmland, parkland and other areas with scattered trees, they use tree holes.* ***Eurasian Jackdaws*** *often take over the nest-holes of Black Woodpeckers* (Dryocopus martius), *though only near woodland edge. Where tree holes are in short supply, jackdaws have been recorded nesting in rabbit burrows. Other suitable sites include cliff faces and old buildings; the ornate roofs of cathedrals are a favourite. One of the few differences in behaviour between the two jackdaw species is that the Daurian Jackdaw* (C. dauuricus) *will sometimes build nests in open sites in the tree canopy, though possibly only when suitable cavity sites are not available. The density of Eurasian Jackdaw colonies depends on the availability of holes. To avoid nest predation, jackdaws prefer holes with small entrances, and holes which have been predated are less likely to be used in subsequent years. Resident pairs defend their nest-site throughout the year, but will move if a better one becomes available. However, a large, successful breeding colony on a cliff can make use of all the cavities available. As colony size increases, nest predation decreases, because group defence against predators like ravens improves.*

[*Corvus monedula*, Germany. Photo: Konrad Wothe]

their parents and, when mature, they breed in pairs in their home flock at separate nests; the majority of individuals probably live their entire life within their home-flock territory. Territories, which can have several active nests, are therefore the exclusive property of the flocks and are stable in size and location for decades; variation in social structure, correlated with habitat structure and composition, was recently detected at a study site in Sierra del Carmen, in Mexico. Both the parents and other individuals care for a single brood. Pair territories appear not to exist for the Mexican Jay, and it is suggested that any behaviour that could be termed territorial aggression likewise is non-existent. The Mexican Jay presents the highest level of communal breeding known among jays.

Among the Neotropical jays for which the relevant details are known, co-operative breeding seems to be frequent, although the documentation for some species is based on only one or a few studied sites, as for the Azure Jay, the Curl-crested Jay and the Plush-crested Jay. In both subspecies groups of the Green Jay, the young stay with the parents for one year; young of the Middle American subspecies, however, are driven from their parental groups after one year and do not provide benefits for the siblings, whereas those of the South American races stay for longer, usually for two years, and help at the nest. The San Blas Jay has a large number of breeders per flock and extensive mutual helping among breeders. In the Brown Jay, the co-operative breeding system varies. In a population in Monteverde, in Costa Rica, studied over a period of 13 years, this species exhibited the complete spectrum of co-operative breeding, from an adult nuclear pair assisted by non-breeding young birds to the extreme of communal breeding similar to that of the Mexican Jay. In this Costa Rican population, it was possible to identify situations ranging from incomplete habitat saturation, in which the jays maintained moderate group sizes, to more complete saturation, in which they maintained larger group sizes and showed increased aggression at high densities. Sociality has not simply been forced on that population, because even at low densities, and in the presence of ample unused habitat, the Monteverde Brown Jays bred only in flocks. Similar variation of the breeding system was detected for the White-throated Magpie-jay: singular breeding, involving a single breeding pair within a given group range, to true plural breeding, with multiple breeding pairs within a given range, and partial range-sharing among related females. In contrast to most corvids, an extremely male-biased natal dispersal is a feature of the Brown Jay and the White-throated Magpie-jay. Recent study at the Monteverde site suggests that Brown Jay males invest less in nesting activities compared with other well-studied New World jays.

In the Old World, the Iberian Azure-winged Magpie has helpers in family flocks. A study in south-eastern Portugal, however, suggests that helpers are more frequent in years with more severe weather conditions, and helper presence significantly increases provisioning rates and breeding success of the breeders. Each flock defends an extensive territory throughout the year against other flocks, although the species sometimes roosts communally. Helpers participate in the delivering of nest material and in nest-building, in the feeding of the incubating or brooding female, in feeding the nestlings and fledglings, and in the removing of the chicks' faecal sacs; they were found not to participate in incubation, or the brooding of the young.

Reproduction by the Common Magpie, the Black-billed Magpie and the Yellow-billed Magpie has been extensively studied, providing a tremendous body of information. As pointed out by T. R. Birkhead in his 1991 monograph of this group, the three species differ fairly constantly in terms of nest spacing. In northern Europe, the Common Magpie defends territories of 5 ha on average, with its nests regularly spaced; some territories are occupied throughout the year. In the territories of the Common Magpie both breeding and feeding activities take place. Yellow-billed Magpies breed in small, loose colonies, in which each pair defends a territory of about 1 ha during the breeding season; foraging occurs either within the territory or in communal feeding areas outside it. The Black-billed Magpie has an intermediate system, its nests being aggregated, but generally less so than those of Yellow-billed Magpies. The Black-billed Magpie either performs no territorial defence or defends a relatively small area of only about 0·3 ha around its nest during the breeding season; breeding individuals forage mainly outside their territories, and usually in pairs. Interestingly, Common Magpie nests in Spain and north Africa are clumped, like those of the Black-billed Magpie, but unlike Common Magpie nests farther north in Europe. Although ecological reasons for these geographical differences are not clear, variations in food supply are probably associated. In an experimental study conducted by J. J. Soler and M. Soler at Hoya de Guadix, in south Spain, the effects of food supplemen-



*The **Black Magpie**, considered to be one of the most primitive members of the Corvidae, assembles a crudely constructed platform of twigs with a shallow cup in which it lays two to three whitish, finely speckled eggs. The rim of the nest may be decorated with flowers or mosses. Eggs have been reported in Borneo, where the race* aterrimus *occurs, rather later in the year than in the nominate race of the Malay Peninsula. The two races are well differentiated and may represent separate species. To date, these birds have received remarkably little study.*

[*Platysmurus leucopterus leucopterus*,
Taman Negara, Malaysia.
Photo: Ong Kiem Sian]



*The female **Eurasian Jackdaw** incubates the eggs alone, and is fed at the nest by the male. Clutch size in both jackdaw species is typically around four, but can vary from two to eight. Eggs laid later in the sequence tend to be progressively smaller, and less likely to result in fledged young. Average incubation periods within the genus* Corvus *seem to be related to the size of the species, being 17–18 days in the Eurasian Jackdaw, 18–19 days in the Carrion Crow* (C. corone)*, and 20–21 days in the Common Raven* (C. corax)*. However, these figures can vary; and a period of up to 23 days has been recorded in the Eurasian Jackdaw.*

[*Corvus monedula spermologus*, near Logroño, La Rioja, Spain. Photo: Joseba del Villar]

tation on a population of Common Magpies were found to be that males built significantly larger nests and females laid significantly larger eggs.

During the spring, the Eurasian Jay is territorial and it no longer tolerates the presence of one-year-old jays. Its territories, covering 6·7–14 ha and in which occur courtship, breeding, feeding and food-caching, do not overlap; sometimes, individuals leave the territory in order to collect food for caching. Outside the breeding season, territoriality seems weak or non-existent and other one-year-olds are tolerated in the home range, which has an average size of 12·7 ha. In Toscany, in western Italy, the social system of the Eurasian Jay is possibly different from that in north Europe: individuals in Italy shifted their home range from areas with pine woods in summer to areas with scrub and olive (*Olea*) in autumn, and thence lived at a higher density of 484 individuals per km². In some years, failure of the acorn crop results in mass evacuation of the breeding areas in autumn and sometimes large eruptive flocks. The Spotted Nutcracker is also solitary and territorial; in a study in Austria, this species was found to be basically resident, within a home range of 5–10 ha, and to have much smaller territories with a radius of 25–40 m from the nest.



*High ledges in old buildings sometimes provide **Red-billed Choughs** with a convenient substitute for natural sites in the roofs of caves or rock chimneys. The female alone broods the nestlings, a duty which tails off after the first ten days. Otherwise, the parents share equally in tasks like feeding the nestlings, and removing faecal sacs. They are occasionally assisted at the nest by a helper, probably from a previous brood. The young remain in the nest for 36–41 days, and stay with the family group for up to 50 days after fledging. Choughs pair for life, but first-year and second-year pairings can be short-term until each bird finds the right partner.*

[*Pyrrhocorax pyrrhocorax erythroramphos*, Erla, Zaragoza, Spain. Photo: Ricardo Vila]

The Siberian Jay maintains territorial flocks during all months of the year, a territory containing a pair and 3–6 further individuals. The offspring may continue to share the territory with the adults and are tolerated at resources for extended periods; indeed, their assistance in feeding the fledgings may extend well into the time when the chicks become independent. This tolerance of the young is viewed as a case of prolonged parental care, suggesting co-operation. There is, however, no evidence that retained offspring help at the nest. Dominant brood-members may act to expel subordinates, forcing them to disperse. The social unit is then disrupted, contact between the territorial pair and juvenile group-members decreasing; the juveniles are then chased by the adults. With the Grey Jay, a single additional individual will mob potential predators and defend the territory, but it is aggressively excluded from the nest by the breeding male, although it may sometimes feed the fledglings.

Although the genus *Corvus* is essentially territorial, several species may tend towards the colonial system in some situations. The Rook is one of the few members of the genus that is a truly colonial breeder, its nests densely clustered in treetops. In regions with very high numbers of individuals, these rookeries may be connected by scattered nests to such an extent that most of the tall trees of the area seem to comprise part of an enormous far-flung rookery. Each nest is tended by a single pair, which defends a territory consisting of a tiny area around the nest. The area around the colony is used for feeding, and no aggressive interactions among the individuals have been observed. The Rook is gregarious also outside the breeding season when feeding, roosting and on migration, although the pair is the chief constituent unit. The Eurasian Jackdaw is another example of a true colonial breeder, although solitary pairs are not uncommon. This species often has a high density of nests in one site, even in one large tree or along a short section of a cliff; sometimes, because of the way in which suitable nesting sites are arranged, pairs may nest at a considerable distance from their nearest neighbours. Outside the breeding period the Eurasian Jackdaw lives in flocks, pairs again being the basic unit, and at certain periods very large flocks, often associated with Rooks, can be observed. The Carrion Crow is essentially territorial, each pair defending a territory of about 0·14–0·46 km², and these territories can be either partly overlapping or discrete, but not necessarily contiguous. This species' territory serves for nesting, and the adults cover most of it every day in the search for food; territorial individuals are rarely seen outside the territory in the breeding season. Sometimes, where suitable nest-sites are few and concentrated in extensive feeding areas, Carrion Crow nests are so close together as to form a loose colony and, exceptionally, colonial nesting has been reported, as in north-east Germany. Helpers at Carrion Crow nests have been recorded in Switzerland and northern Spain. A recent study, in which supplementary food was placed in the territories of Carrion Crows, suggested that the availability of food resources positively affected the tendency of the young to remain in the natal territory and promoted helping behaviour.

The *Corvus* species in North America exhibit differences in their breeding systems, even within the same species. A population of the Chihuahuan Raven studied in New Mexico did not show any sign of co-operative breeding, but this species is reported as co-operating in defence against predators. The American Crow varies in its reproduction system, populations living in California showing tendencies to nest in colonies, those in Florida to defend territories during the breeding season, and those in Massachusetts to defend territories throughout the year. The core areas around the nests occupied by pairs and families of western populations are small, overlap extensively with those of neighbours, and are not defended against conspecifics. Average territory sizes are 42 ha in Massachusetts, while in the western USA there are on average 0·8 pairs per hectare. Helpers at the nest were recorded in several studies of the American Crow. In Florida, three or four yearlings participated in all phases of nesting, including nest-building, the feeding of the female during incubation and brooding, caring for the nestlings, and defending the nest and territory. In California, delayed breeding and dispersal were also recorded, which suggests similarities to the co-operative breeding of the American jays. The Northwestern Crow likewise has helpers, but there is only one helper per nest and, moreover, not all nests of this species have a helper. Helpers feed and cache food in the territory, which represents a cost for the breeding pair; in addition, the breeding male sometimes feeds the helper. In the case of the Northwestern Crow, however, helpers participate to varying degrees in territory and nest defence, and feed the nestlings and the fledglings; it was found that pairs with helpers laid larger clutches and produced



*The endemic **Taiwan Blue Magpie** is the only species in Taiwan known to breed co-operatively. It is generally found in groups of six or more. All flock members take part in nest-building and defence, but the female alone incubates the 5–6 eggs. In the various blue magpie species in which co-operative breeding has been observed, the breeding pair alone appears to feed the nestlings, the female doing most of the work. The helpers, assumed to be the young of the previous year, then assist in feeding the fledglings.*

[*Urocissa caerulea*, Kinmen, Taiwan. Photo: Yung-Fu Chen]



White-necked Ravens *choose inaccessible sites on cliffs where possible, although exceptionally they have been found nesting in trees. A typical clutch is of four eggs, but as few as one and as many as seven have been recorded. The chicks are mostly fed by the female, by regurgitation. Ravens and other corvids begin to incubate before the clutch is complete, so that eggs hatch asynchronously. The first eggs laid tend to be larger, and produce larger hatchlings. As in this picture, the parent gives most attention to the larger, more vigorous birds. If food is limited, the young tend to starve to death in reverse order of hatching, and resources are concentrated on those with the best chance of survival.*

[*Corvus albicollis*, Domboshawa, Harare, Zimbabwe. Photo: Alan S. Weaving/ Ardea]

more fledglings per nest than pairs without helpers. It is possible that the strategy of co-operative breeding by the Northwestern Crow is of recent origin. This species defends a territory only during breeding season, the territory's average size of 0·49 ha and the average inter-nest distance of 17·8 m being relatively small when compared with those of European *Corvus* species. The Fish Crow forms small colonies, but the number of nests in a colony seems smaller than that in colonies of the American Crow in California.

The Common Raven is generally seen solitarily, in pairs, or in flocks outside the breeding season. In his monograph on this species, D. Ratcliffe mentioned that territory-holders commonly remain in the territory, which ranges in size from 2·8 km² to 66·7 km², throughout the year, even in severe weather. Typically, nesting places are traditional, occupied for as long as anyone locally can remember, and sometimes with a history of use going back well over a century. The nesting places are the central and fixed point in a Common Raven's life, becoming the roosting sites outside the breeding season; as the time for breeding approaches, each pair can be seen more constantly in the vicinity of the nest.

Although the Red-billed Chough is territorial, it will occasionally form small loose colonies. In places where this species is numerous or where suitable nest-sites are few and concentrated, as in parts of Spain, several pairs may breed close together and apparently defend as a territory only the area around the nest.

Corvids usually build their nests on trees, generally at the fork of a branch, where they can fix them firmly. They may use shrubs, instead of a tree, or even nest on the ground, among shrubby thickets; the Carrion Crow has been found breeding in *Phragmites* reedbeds in western Mongolia. Other sites commonly utilized include cliffs, as in the case of the Common Raven and the choughs. Artificial structures, such as roof supports, outbuilding walls, telegraph poles and electricity pylons, are also commonly used. Nest-site selection may be linked to the reduction of nest predation, as with the Carrion Crow and the Siberian Jay, to reduction of the negative effects of the weather, as with the Pinyon Jay, and to both of those selective pressures, as with the Brown Jay. The Asian Azure-winged Magpie, however, uses nest-sites that are more concealed by leaf cover in the absence of the Japanese Sparrowhawk (*Accipiter gularis*) that they are when the latter is present; it may be supposed that this magpie species avoids nest predation by exploiting the defence behaviour of the hawks.

Nests of the Corvidae consist typically of an open cup, with a platform of sticks or large stems and an inner lining of softer substances. The clutch size varies from one to nine eggs, but is commonly from two to four. Corvid eggs are usually a shade of blue or green with darker grey or lilac underlying markings. In-



For the first ten days after hatching, ***Rook*** *nestlings are dependent on food brought to the nest by the male, which also feeds the female while she is incubating and brooding. But as the young become larger and more demanding, the female too brings them food. The parenting skills of Rooks seem to improve with age. Young females lay smaller clutches than older ones, whereas older males are more successful in raising young to fledging.*

[*Corvus frugilegus frugilegus*, Le Meillard, France. Photo: Cyril Ruoso/Bios]



Near Granada, in southern Spain, nest parasitism by the Great Spotted Cuckoo (Clamator glandarius) *has a strong adverse effect on populations of the* ***Common Magpie****. The Great Spotted Cuckoo parasitizes four corvid species in this area, but cuckoo eggs laid in magpie nests are twice as likely to succeed as those laid in nests of the Carrion Crow* (Corvus corone)*. The cuckoo's gape stimulates the magpie to feed it at a higher rate than its own offspring.*

[*Pica pica melanotos*, Pinto, Madrid, Spain. Photo: Luis Miguel Ruiz Gordón]

cubation is undertaken by the female alone. The nestling period can be relatively short, being no more than twelve days in the case of the Florida Scrub-jay, or relatively long, that of the Pied Crow lasting for 45 days. Young corvids may require rather a long time before they are able to fly strongly. The Brown-necked Raven, for example, takes 42–45 days to reach the stage when it can fly really efficiently.

Large corvids, when they have reached adulthood, seem to have few natural predators, or, at least, fewer than other passerines. Nevertheless, adult Common Ravens have been reported as being killed by Golden Eagles (*Aquila chrysaetos*) and Peregrine Falcons (*Falco peregrinus*), and by terrestrial predators including coyotes and wolves. Several species of crow have been recorded as falling prey to the Northern Goshawk (*Accipiter gentilis*) and the Eurasian Eagle-owl (*Bubo bubo*), and even smaller birds of prey, such as the Tawny Owl (*Strix aluco*), will sometimes kill larger corvids. The Eurasian Jay, which lives in forest and frequently seeks the security of the trees, is preyed on by specialized hawks such as the Eurasian Sparrowhawk (*Accipiter nisus*).

In the Neotropics, the eggs and young are vulnerable to a great range of predators, from monkeys to toucans (Ramphastidae). There are also records of corvids being killed by other members of their family, such as Common Magpies killing, and being killed by, Carrion Crows. In southern Spain, the Great Spotted Cuckoo (*Clamator glandarius*) used the nests of four corvid species, especially the Common Magpie and the Carrion Crow, in which to lay its eggs; this nest parasitism had a strong adverse impact on the populations of the Common Magpie.

Movements

Populations of several corvid species in the Northern Hemisphere are partially migratory, while corvids living in the Southern Hemisphere are, so far as is known, sedentary. Migratory distances are highly variable from one species to another, and even among populations of a single species living in different localities. Short movements during the winter are made by some species living at higher altitudes, such as the Yellow-billed Chough. Among migratory populations of the Eurasian Jackdaw, those from Scandinavia reach the Low Countries and Denmark, and sometimes also France and Britain, and these could be considered to be examples of a short-distance migrant when compared with birds of this species living in Finland, which reach France; numerous recoveries of ringed individuals indicate many distances exceeding 1000 km. Data on the Eurasian Jackdaw, the Daurian Jackdaw and the Rook indicate that juveniles migrate more, and for longer distances, than adults.

Data on the Rook in Russia suggest a recent tendency towards a progressively shorter migration route. The average distance of movement was 2200 km in 1929–1938, 1900 km in 1950, and 1400 km in 1971–1985. It is possible that an increase in food resources in urban areas, such as in the Moscow region, is related to this reduction in migratory distance. Winter recoveries of Finnish nestlings and juveniles of the Carrion Crow reveal a reduction in the proportion of individuals migrating and in the mean distances covered. It is thought that the reduction in the extent of migration of north European birds is probably due chiefly



Young ***Hooded Crows*** *fledge at 3–5 weeks, but continue to be fed by the parents for 2–3 weeks more, and often throughout their first winter. Rapid weight gain is a good indicator of survival to independence, and future fitness. In a study in Switzerland, chicks of the closely related Carrion Crow* (Corvus corone) *in an urban environment were found to take longer to reach fledging weight than a nearby population on agricultural land, and they weighed less at fledging. The urban birds also had shorter tarsi on fledging. Tarsus length is fixed at the time of fledging, and 79% of the urban fledglings were deemed to have fallen below the minimum size for territory acquisition, and to be excluded from breeding.*

[*Corvus cornix cornix*, Colonsay, Scotland. Photo: Ian Fisher]

to increasing supplies of winter food at rubbish dumps within the breeding range, and perhaps also to climatic amelioration.

Northern populations of the Common Raven are mainly sedentary, but are more prone to make southward movements in winter than the southern populations. Nevertheless, immatures of southern populations do make extensive movements. The Carrion Crow varies from being migratory in the north of its range to being sedentary in the south and west; many of its populations are only partially migratory.

The Rook populations of northern Europe migrate southwards to wintering grounds in temperate Europe, thus leaving their rookeries. Abandonment of the rookery area in winter occurs also in some Scottish Highland valleys. A study in Deeside, in east Scotland, showed that the local Rooks, and also the Eurasian Jackdaws, were mostly dependent on stubble grain for food in the autumn and early winter; this food resource was depleted earlier in the upper parts of the valley than in the lower ones, which led the populations in higher areas to descend to lower areas from autumn until mid-winter. During the second half of the winter, when weather conditions had worsened, the Rooks made regular diurnal visits to their breeding areas, involving round trips of 90 km, to spend, at times, only two-and-a-half hours there. It is supposed that, after the Rooks have accumulated fat, the principal motivation for their return to the rookery in the upper valley during the coldest period of winter is that of defending the sites that they chose in the autumn.

Flocks of Blue Jays are seen flying in numbers that can reach 100 or more. These flocks typically avoid crossing large open stretches of water. The Rook migrates by day in flocks, often following leading lines such as coastlines and river valleys, and often in company of Eurasian Jackdaws or Daurian Jackdaws.

Periodic eruptive migration is a characteristic of some species, and is the result chiefly of the failure of seeds of conifer crops. The production of seeds of conifers is clearly synchronized, irregular and unpredictable. In the case of, for example, the pinyon pine, the production of seeds, the principal food resource of the Pinyon Jay, is highly variable from year to year, large crops occurring every four to seven years in any one area; this means that huge areas of the pinyon woodland produce a large seed crop, but neighbouring areas are barren. In one year a single tree can bear hundreds or thousands of seeds, and in the next year no seeds are found for miles around that area. There is a report that, in Arizona, one year of quite low production of pinyon pine seeds was followed by one with the maximum production ever recorded there. Years with low seed production force Pinyon Jay flocks to converge on the areas of remaining available seeds, which are sometimes well away from the species' normal range and habitat; such areas then become temporary "hot spots" for that corvid. A similar scenario applies to the largely sympatric Clark's Nutcracker. If the crops of the pinyon pine and whitebark pine, this species' principal food resources, fail, swarms of Clark's Nutcracker may leave the mountain forest and spread all the way down the Pacific coastlands of North America. Such events are sparse in the life of this nutcracker, occurring once every 15 years. Less dependent on conifer seeds, but overlapping in distribution with the Pinyon Jay and Clark's Nutcracker, Steller's Jay occasionally invades areas where it is normally absent.

In Europe, eruptions of the Eurasian Jay populations living in the eastern and northern regions, which take the birds well into the west and south of the continent, are probably associated with failure of the acorn crop. The numbers involved and the extent of the movement vary greatly; the longest distance recorded is 3000 km, by one ringed individual that was recaptured. Years with low production of acorns generally follow years with high acorn production, as with the case of the pinyon pine. At times when seed production is very poor, many hundreds or even thousands of jays may be seen flying in search of more productive regions, visiting areas where they are not normally encountered. In Scandinavia, seasonal movements occur each year, especially from north of the distribution of the oak, with eruptions every few years. A famous eruption of Eurasian Jays occurred in 1983, when a massive influx into Britain was recorded; involving many thousands of individuals, this huge invasion began in mid-September and continued to the beginning of November. Several reports of unusually high numbers of jays in the spring of 1984 probably related to the return passage of these jays. Most of the migrants are juveniles, and a considerable proportion of them returns to the area of origin.

The Spotted Nutcracker subspecies *macrorhynchos* is a true eruptive migrant, while the other races of this species are more sedentary. Failure of the seed crop of the Siberian stone pine (*Pinus sibirica*) is associated with the movements of this species, such eruptions having been recorded in Europe on some 25 occasions in the past 250 years. Individual numbers during these



*Having delivered food, this parent **Eurasian Jay** is waiting patiently for the young bird to produce a faecal sac. The nest is noticeably clean, despite the advanced age of the young. Adult corvids carry the faecal sacs away, rather than eating them. Young Eurasian Jays remain in the nest until about 21–22 days, and become independent of their parents at 7–8 weeks. After this, their parents may become aggressive towards them. By the following spring, parent birds will not tolerate their own yearlings within the territory.*

[*Garrulus glandarius fasciatus*, Burgos, Spain. Photo: José Luis Gómez de Francisco]



*Adult **Plush-crested Jays** continue to feed juveniles for around 90 days after they have left the nest. Studies at a few sites indicate that this species is a co-operative breeder, and so some young may stay on to help their parents raise the next year's brood. But the nature of co-operative breeding in Neotropical jays can vary, even within the same species. Although all subspecies of Green Jay* (Cyanocorax yncas) *keep their young with them for a year, the Middle American races drive them away before breeding commences, whereas in the South American races, they stay on for two years.*

[*Cyanocorax chrysops chrysops*, Río Pilcomayo National Park, Argentina. Photos: José Calo]

eruptive movements may reach more than 10,000, as recorded in Germany. Although some of the nutcrackers return towards the areas of their origin, little return movement is witnessed in the following spring.

Daily movements from roosting areas to feeding areas are a common phenomenon for several corvid species, such as the Carrion Crow, the Common Raven, the American Crow and the Torresian Crow, among others. These movements are over short distances, because, in order to minimize travelling costs, the roosting areas are always close to the foraging areas that will be explored on the next day. This is the "patch-sitting" hypothesis, which predicts that birds will roost close to their diurnal activity centre or to the current superabundant food supply, and will use that feeding area in the morning, when their energy needs are the greatest. Both the Red-billed Chough and the Yellow-billed Chough often make daily altitudinal movements of up to several kilometres between roosting and feeding sites.

Relationship with Man

The fact that corvids are common and conspicuous birds in many parts of the world, including in urban areas, makes them quite popular in human culture, and they feature in, for example, folklore, legend, literature, and a large variety of artistic expressions. In films, the image and/or the voices of crows have been frequently used, being associated mostly with situations of terror, suspense or death or feelings of human isolation. In literature, crows are constantly used as a symbol of death, as in the famous poem by Edgar Allan Poe *The Raven*. Crows also served as symbols of death and misfortune in paintings by Hieronymus Bosch, Giovanni Bellini, Pieter Brueghel, and Vincent Van Gogh.

Species in the genus *Corvus* are featured in many myths. The Common Raven, in particular, has held a notable place in the minds of people in the Northern Hemisphere, playing a powerful role as a symbol of supernatural forces. As Ratcliffe wrote in his monograph on the species, people could see human attributes or meaning in the Common Raven's appearance, and its significance in these human associations was as a bearer of omens, which could be good or bad; ravens deliver messages from on high to foretell the outcome of important events. The black plumage, the raucous and sepulchral voice, the species' ability to mimic human speech, and its carrion-eating habits were seen as proof of the connection between the bird and dark forces and death. Ravens were regarded as prophets, soothsayers and magicians, with supernatural powers, including the ability to transmutate into human form. There is a superstitious belief in the talismanic powers of raven relics, such as bones or beaks, and the mythical "Raven stone" was supposedly brought by the bird from the sea to its nest. In various cultures the Common Raven appears in a prominent position. The association with Norsemen is very well known. Their war-god Odin had two Common Ravens named Hugin and Munin, or "Thought" and "Memory". According to legend, Hugin and Munin flew all over the world to gather information and returned in the evening, when they sat on the shoulder of Odin and whispered in his ears what they had seen. Another famous association of ravens, this time in England, is with the Tower of London; there must always be six individual Common Ravens in residence in this medieval fortress, because otherwise the Crown would be at risk of demise. On the Bayeux Tapestry of the Battle of Hastings, William the Conqueror has a Common Raven painted on a standard behind him. Some native North Americans honour ravens by placing them at the top of huge totems.

Among native Americans and ancient Asian peoples, and in traditional European cultures, crows produce similar feelings to those evoked by ravens. Some cultures seem not to distinguish between crows and ravens. Others have joined the two together in their stories, possibly because, in nature, crows routinely mob ravens to keep them from raiding their nests or stealing their food. Immortality is another quality attributed to both crows and ravens, and is due, most likely, to the tendency of these birds to persist from generation to generation in stable territories.

The North American Indians of the plains associated *Pica* magpies with war or death, because the carrion-eating habits of these birds were frequently in evidence on the battlefields. Indians regularly used the feathers and the carcasses of magpies as ornaments. The symbolism associated with magpies and jays, however, is, in general, different from that attributed to crows and ravens. In Portugal, magpies are associated with people who talk too much. The Portuguese king John the First is said to have ordered his workers to paint magpies all over the roof of a room at the Sintra's Palace so as to advise his court against gossiping; this room can be visited nowadays on tourist excursions into the palace, and is known as the "Room of the Magpies". In La Fontaine's *Fables*, magpies were used as examples of beautiful colour but poor voice in order to illustrate that good looks can





*Young **Mexican Jays** remain with their parents and, when mature, breed within the natal territory. Most individuals probably live their entire lives within their home-flock territory, which can remain stable for decades. Juveniles differ from adults in being smaller and duller, with brown rather than black legs, and a paler bill, until they attain adult plumage about 12 months after hatching. Mexican Jays have an extremely complex breeding system, which varies from monogamy to polygynandry (several breeding males and breeding females in one social group). Exclusive pair-bonds are rare. Each female is guarded by a dominant male, which sires most or all young in her nest. However, the female also mates with subordinate males, and a clutch frequently has several fathers. While incubating, the female is fed by the guarding male and most other group members; similarly, the young are fed by the entire group throughout their time in the nest, and for several weeks afterwards. In their turn, the young of the semi-colonial, non-co-operative **Little Raven** fledge at around 37 days, and join flocks of adults soon afterwards. They then move away from the breeding area, part of a number of strategies, including flexibility over the breeding "season", which enable this species to avoid competition with the sedentary and dominant Australian Raven* (Corvus coronoides). *The irides of young Little Ravens change from blue-grey while they are in the nest, to dark brown at fledging, and attain the white colour of the adult iris in the bird's second year.*

[Above: *Aphelocoma ultramarina arizonae*, Arizona, USA. Photo: Mary McDonald/ naturepl.com

Below: *Corvus mellori*, Geelong, Victoria, Australia. Photo: Peter Fuller]



*Young **Clark's Nutcrackers** remain dependent on their parents until they are 3–4 months old. Throughout this period, they are fed with the pine seeds their parents cached during the previous year, along with some insects. They become independent when they learn to locate their parents' caches for themselves, by recognizing germinating conifer seeds. The use of cached seeds means breeding can start before other foods become available, from as early as mid-February, despite harsh winter conditions. Finishing breeding early gives both adults and juveniles time to build their food hoards. The young birds are ready to breed in their second winter.*

[*Nucifraga columbiana*, Banff National Park, Rocky Mountains, Alberta, Canada. Photo: Oriol Alamany]

indicate a lack of deeper or more endearing qualities. Jays, too, are associated with people who talk too much, and both they and magpies are linked with thievery, probably because of their nest-predation habits. In north-eastern Brazil, the finding of a nest of the White-naped Jay is an omen of good luck for all life; in contrast, for some native American peoples, the finding of a Grey Jay's nest brings with it serious bad fortune.

It is not just the close physical association of corvids and humans that has made these birds so popular in human culture. Rather, there is a real interaction between humans and corvids, as shown by Heinrich, Marzluff and Angel. Such interactions began a long time ago, when the nomad ancestors of modern man searched for game and fish. The earliest expression of human kind, recorded some 30,000 years ago in the caves of Lascaux, in western France, feature a crow-headed man and a totemic bird form thought to represent the external soul. There is evidence that ancient hunters and fishermen may have benefited from interacting with corvids; the Hän people of Yukon, in Canada, mimicked the raven's call to attract bears to their hunting areas, and Inuit hunters in Greenland noted an association between ravens passing overhead and nearby caribou (*Rangifer*). Heinrich argued that the close relationship between ravens and wolves has been replaced by a bond with humans, the new dominant drive-hunting predator.

Numerous opportunities exist for corvids to watch humans and to learn about new foods, new threats, and new habitats in urban and rural areas. Crows have learned to recognize a variety of food types, from those dating back to early human history through to the extraordinary variety in a flourishing modern city, including fruits and vegetables from around the world, cooked meats of all shapes, sizes and colours, bread, pastry, noodles, ice cream, potato chips, sauces and cheese puffs, among others. Goodwin highlighted the ability of crows around the world to recognize bread as food. The capacity of corvids to memorize what they see does not make social learning a complex process; observation and imitation of others is a simple form of learning that allows culture to develop. Marzluff and Angel suggested that corvids, in particular crows and ravens, have a culture, and that cultural evolution is an important reason why they live so successfully with humans. In Wisconsin, in the northern USA, R. L. Knight noticed that in rural areas, where crows are accustomed to being shot at, these birds call loudly as people come near their nest trees, but they stay out of shooting range, even if a person climbs to the nest; in contrast, in Madison city, where it is illegal to discharge a gun, crows are quiet, even if a person stands at the base of their nest tree. There are numerous examples that show how corvids learn local tradition and modify their behaviour through a rudimentary form of cultural learning.

Some aspects of crow and raven behaviour and human culture appear to evolve together in a mutually reinforcing way. Marzluff and Angel argued that such situations, where interactions among species lead to social learning and evolution of each species' culture, may be interpreted as culture co-evolution. The



*The pale eyes of the restricted-range **Long-billed Crow** suggest an affinity with the Australian white-eyed crows and ravens. This species is confined to the northern Moluccas, in Indonesia, where it overlaps with the Torresian Crow* (Corvus orru)*, the only Australian corvid also found outside of Australia. It may, however, be more closely related to the Slender-billed Crow* (C. enca)*, which is widespread on Indonesian islands to the east, and which has a bewildering array of bill shapes among its races, though none approaching the length of the Long-billed Crow's. A forest-dwelling species, it still seems to be common and widespread on the large island of Halmahera.*

[*Corvus validus*, Halmahera, Indonesia. Photo: Morten Strange]



Endemic to Santa Cruz Island, the largest of the California Channel Islands at 250 km², the ***Island Scrub-jay*** *is found in oak-dominated chaparral. This habitat is recovering following efforts to control introduced sheep and pigs. In 2003, the population was conservatively estimated at 9000, of which 7000 were reckoned to be breeders. The 2000 non-breeders include "floaters", young birds forced to delay reproduction, possibly for several years, until a territory becomes available. Although the Island Scrub-jay seems at only limited immediate risk, its tiny range and the historical degradation of its habitat have led to its listing as Near-threatened.*

[*Aphelocoma insularis*, Santa Cruz Island, California, USA. Photo: Stefan Oscarsson]

nut-cracking behaviour of Carrion Crows in Japan is perhaps the best example of such cultural co-evolution. In Sendai, in northern Japan, Carrion Crows have learnt another method of cracking hard-shelled nuts, besides simply using gravity; the crows placed seeds on roadways and waited for automobiles to run over them. This behaviour was observed first in the 1960s, but was documented only some years later, by researchers such as H. Higuchi, who reported this first for the cracking of walnuts (*Juglans*). Photographs clearly show that the crows, holding walnuts, first wait for traffic to stop at an intersection, and then fly down in front of stopped cars to position nuts in front of tyres; once the cars have moved on, they return to eat the nuts from the cracked shells. This behaviour has spread slowly, so that other crows in surrounding areas learned this way of cracking nuts; it represents an example of the cultural transmission of behaviour initially learnt through trial and error. The innovative crows' offspring and neighbours would certainly observe and could easily acquire the nut-cracking habit. A new element developed after the "smart activity" of crows had been divulged; car-drivers began to help the crows by intentionally driving over nuts placed on roadways. Higuchi mentioned that, because people enjoyed cracking nuts for the crows, this behaviour has been reinforced in the crow culture and nowadays is well developed over a large area.

It took time, however, for such modern perceptions of wildlife to be reached. In the Middle Ages, ravens, crows and magpies were common inhabitants of towns and villages in Europe, living on the refuse and discarded food that was, because of the lack of concern about hygiene, so freely available. At that time, corvids were welcomed in urban areas because of their scavenging habits; they were seen as friendly cleaners. There are some indications that it was forbidden to shoot ravens because they were considered to drive away bad air. Situations changed dramatically, however, when towns and villages became cleaner and their residents more conscious of hygiene. Corvids then lost their function and were no longer welcomed, and they moved to the surrounding agricultural areas. Here, livestock management was widespread, yet primitive by the standards of today, with high mortality rates of animals old and young, which must have supplied the scavenger corvids with a rich source of food. The association with agriculture created further problems. By feeding on crops, corvids caused damage to agriculture in the early sixteenth century in Europe; the well-known figure of the scarecrow is emblematic of the strange feelings of humans towards crows that eat man's food. Reinforcing these feelings, crows acquired a reputation as killers of domestic animals. At poultry farms with open-top pens, magpies learned to steal eggs, food and young chicks. This problem could be easily solved by covering the top of the pens, but people preferred, instead, an inexpensive campaign of poisoning. Corvids in general were then shot, trapped or poisoned. In the case of magpies, the most effective method, albeit illegal, involved poison baits; these were usually a chicken or pheasant egg laced with the highly toxic insecticide phosdrin, which kills very rapidly, or with alpha-chloralose, which does



Extremely sensitive to human disturbance, the ***Beautiful Jay*** *is found only in a narrow band of wet foothill and premontane forest in west Colombia and north-west Ecuador. As well as suffering extensive logging, this forest has been penetrated by roads, leading to clearance for grazing, plantation crops and human settlement. The Beautiful Jay is also one of a growing number of Neotropical species threatened by coca cultivation for drug trafficking. Its exact population is unknown, but it is rare and patchily distributed, and has been declining since the 1970s. It is listed as Near-threatened.*

[*Cyanolyca pulchra*, Bellavista Cloud Forest Reserve, Ecuador. Photo: Greg & Yvonne Dean/ WorldWildlifeImages.com]



*The **Azure Jay** has already become extinct in some areas where it was previously recorded, such as near Porto Alegre in the south of Brazil. It may also be suffering from over-harvesting of araucaria seeds for human consumption, since it depends on these seeds during the winter. Unexpectedly, in view of its apparent dependence on primary forest, it is increasing on the Brazilian island of Santa Catarina, where it is now common in urban areas and secondary forest. But because of its moderate decline elsewhere, it is listed as Near-threatened.*

[*Cyanocorax caeruleus*, Florianópolis, Santa Catarina, Brazil. Photo: Edson Endrigo]

not kill birds directly but renders them unconscious and they eventually die of hypothermia.

Ratcliffe mentioned that the Common Raven's fall from grace began around 1650. By the eighteenth century, the raven was evidently an object of general dislike in Britain, with a price on its head in many areas. The persecution of the Common Magpie in Britain has changed the habits of this corvid; so confident prior to the eighteenth century that it was called the "cherished neighbour of every farmer", it became quite secretive in its behaviour, "the suspicious thief", "knowing that danger may lurk in every bush". Nowadays, since the persecution is covert and illegal, numbers of corvids have recovered, as in the case of the magpie in many districts of Britain and Ireland.

The rate of increase of Common Magpie populations in suburban England is twice that in rural habits. This can be explained by the fact that conditions in urban areas must be better for magpies than they are in more rural areas. The main problem associated with large populations of magpies in cities is their effect on suburban songbirds, through predation on the latter's eggs and young. Birkhead pointed out two ways in which humans react to



*Still fairly common on the Pacific slope of the Sierra Madre Occidental in northwest Mexico, the **Tufted Jay** lives in relatively inaccessible canyon forest. The threat from logging and clearance is limited, but it is often hunted for fun by schoolboys. Birds confined to small ranges, especially those dependent on forest, are at potential future risk, so this species is listed as Near-threatened. The lack of protected areas in its range has led some to call for it to be listed as globally threatened.*

[*Cyanocorax dickeyi*, Durango, Mexico. Photo: Pete Morris]

the predation of songbird eggs and young by magpies, and these apply also to other corvids. First, there is the emotional reaction, as a magpie kills young while the parents fly noisily and helplessly around; humans do not feel the same way about birds of prey capturing the same young while performing marvellous aerobatics. Secondly, there is the potential impact on the populations of passerines, a subject of recent studies. In Germany, for example, the influence of the Common Magpie on urban bird populations in the city of Osnabrück was analysed; although the population of the magpie increased by 280% from 1986 to 1993, this did not result in a corresponding decrease in the breeding populations of urban songbirds. Similarly, in Berlin, data suggest that magpies have had no effect on the populations of small passerines; even simulated effects of predation by corvids on Whinchats (*Saxicola rubetra*) did not cause a population decline of this passerine.

The tendency of corvids to explore urban areas continues, as illustrated by the well-documented invasion by the Eurasian Jackdaw of the cities of northern Italy, beginning in 1950, or by the Carrion Crow in Milan, in the same region. It is important to mention that, in parts of southern Asia, the Large-billed Crow and the House Crow still play an important role in helping to keep cities clean and sanitary by scavenging on animal and vegetable materials, and mixed flocks of 25–110 crows, scrambling through a fresh pile of refuse on the street, are a not uncommon sight in some places. The House Crow is, perhaps, the best example of urban dependence, as it is not known to live away from human settlement. This species has a great ecological flexibility, having colonized several places, such as Elat, in south Israel, Aden, in Yemen, Medan, in north Sumatra, and Ujung Kulon and Krakatau, both off west Java; it has reached some of them by ship, and become one of the most abundant birds, even at a newly colonized site in the temperate zone, namely The Hague, in the Netherlands. Applying an ecological-niche model, A. Nyári and collaborators predicted the potential future colonization by House Crows of Central America, the Caribbean, equatorial Africa, and mainland and insular South-east Asia.

Corvids have been considered, recently, to be keystone species in restored ecosystems. The consequences of human activities have been the increase of forest fragmentation all over the world; a continuous natural ecosystem becomes a landscape of forest remnants surrounded by agricultural land and urban areas. With simultaneous invasion of the forest remnants by both plant and animal species, the decline of biotic diversity is expected in such landscapes. The corvid habit of storing seeds (see Food and Feeding) may facilitate the regeneration of conifer species, and such constant seed dispersal is quite important, particularly in fragmented forest landscapes, preventing the extinction of those tree species in forest remnants. This has been demonstrated, for example, for the Blue Jay with regard to its habit of storing seeds of Fagaceae tree species in south-eastern Wisconsin. Data suggest that the Blue Jay is a keystone species in deciduous-forest ecosystems because it positively influences populations of nut-bearing trees and also, indirectly, the many species that depend on them. It is the only known organism that transports nuts across dispersal barriers such as cropland. In one studied case, the Blue Jays collected and dispersed only sound, healthy nuts, resulting in dispersal of seeds of the highest quality and viability in terms of future germination; it was estimated that more than half of the acorn crop, some 133,000 nuts, might be transported 1 km or more away from the seed trees by Blue Jays.

Besides the importance of the Corvidae in ecosystem restoration, another page in the relationship between corvids and humans has been written since the end of the twentieth century. The West Nile virus first appeared in the Western Hemisphere in 1999, near New York city, where it caused substantial mortality among corvids, with a few infections in humans. By 2004, it had reached all the states in the USA, as well as other countries in the Americas, including some in South America. It is believed that this virus is transmitted primarily between mosquitoes (Culicidae) and birds. The three bird species that are the most competent hosts are all corvids, namely the Blue Jay, the Western Scrub-jay and the American Crow; the Black-billed Magpie and the Fish Crow are among the 15 most competent



*The smallest of the treepies, the **Andaman Treepie**, is endemic to the Andaman Islands. A recent surge in human population, partly due to settlers from the parent country, India, is putting pressure on the forests on which the treepie depends. Along with most of the other Andaman endemics, it is listed as Near-threatened, but still remains relatively common where forests are intact. A number of national parks and sanctuaries have been established, particularly on smaller islands, but there are concerns that protection may not be sufficient, and uncontrolled tourism is an increasing problem.*

[*Dendrocitta bayleii*, South Andaman Island. Photo: Jon Hornbuckle]

species. This new situation has brought an additional ambivalence towards corvids once again.

Status and Conservation

Owing to their remarkable ability to survive in a variety of abiotic and biotic conditions, corvids are present in reasonable numbers in their various habitats. The fact that most of the 123 species live in open areas or at forest edges makes them more



Along with the White-throated Babbler (Turdoides gularis), *the **Hooded Treepie** is endemic to the Irrawaddy plains of central Myanmar. The dry deciduous forests of these plains have been almost entirely cleared for agriculture, and the treepie has been classified as Near-threatened because of the sharp decline in its population. More recent information suggests that it is still locally common where extensive habitat remains, and that it may be tolerant of degraded habitat such as secondary forest and even scrub-jungle.*

[*Crypsirina cucullata*, Pyay, Myanmar. Photo: Jimmy Chew]



The Cuban race minutus *of the* ***Palm Crow*** *seems never to have been common, but clearance for agriculture is forcing this forest-dwelling bird to retreat, while the more adaptable Cuban Crow* (Corvus nasicus) *takes its place. The Palm Crow is now confined to stands of palms in the cultivated lowlands. The Hispaniolan race has also declined because of forest clearance, but this bird is also hunted for sport and as a delicacy. It occurs in national parks in both Cuba and the Dominican Republic.*

[*Corvus palmarum palmarum*, Dominican Republic. Photo: Roland Seitre]

tolerant of changes in their natural habitats, and corvids may, sometimes, benefit from disturbances of habitat. Documented densities of the Common Magpie, the Carrion Crow, the Eurasian Jay and the Eurasian Jackdaw in Britain increased on farmland over the period 1964–1993.

Nevertheless, several species of corvid that are specialized for life in particular habitats and/or have a restricted range have decreased in number and are threatened to varying degrees. The situation is worrying because some of those habitat specialists have a restricted natural geographical distribution. Of the 123 members of the family currently recognized, twelve species are listed as globally threatened, and a further twelve are considered Near-threatened. In addition, what was presumed to be the last wild individual of the Hawaiian Crow was seen in 2002, and this species appears to be Extinct in the wild. This corvid, together with the Robust Crow (*Corvus viriosus*) and the High-billed Crow (*Corvus impluviatus*), may have become extinct on the island of Maui, in the eastern Hawaiian Group, some hundreds of years ago as a result of the activities of early Polynesians. Captive-breeding of Hawaiian Crows was successful, but, of 27 individuals released in Hawaii, 21 died from predation or disease. The population decline of this species was caused by several factors, including habitat destruction, not only through logging and agriculture, but also through feral ungulates, which



Historically, the ***Collared Crow*** *was fairly common across southern China, Hong Kong, Taiwan and northern Vietnam. It is now only a vagrant in Taiwan, and there are just three recent records from Vietnam. In other places where the birds were once counted in hundreds, single figures are the norm. The only place where counts still exceed 100 appears to be the Deep Bay area of Hong Kong. Rapid agricultural intensification, with over-use of pesticides and rodenticides, is blamed for wiping out its prey. In 2008 it was uplisted to Near-threatened, with an estimated population of 10,000–20,000, based largely on poor-quality data; its true status may be worse.*

[*Corvus pectoralis*, Changbin, Taitung, Taiwan. Photo: Yung-Fu Chen]

destroy the understorey foodplants that are important for this crow. In addition, habitat degradation may have favoured the Hawaiian Hawk (*Buteo solitarius*), which is a crow predator. The impact of shooting, diseases and introduced mammals, including rats (*Rattus*) and a small mongoose (Herpestinae), have also been cited.

Four species in the genus *Corvus* are globally threatened. The White-necked Crow is intolerant of degraded habitats or areas opened up by forest clearance, and it was extirpated from Puerto Rico, where it was once abundant, in about 1963. It is now found only on the neighbouring Caribbean island of Hispaniola. This species was formerly killed by the local people for food. Owing to the fact that its population and range are now small and fragmented, and its numbers continuing to decline, the White-necked Crow is listed as Vulnerable. The Flores Crow is confined to the island of Flores, in the Lesser Sundas, where it is now found mostly as single individuals in the extreme west of the island. Forest fragmentation seems the principal cause of its population decline. High rates of forest destruction on Flores are a cause for alarm over the status and future prospects of this species, which is listed as Endangered.

The decline of the Mariana Crow in Guam has been attributed to predation by the introduced brown tree-snake (*Boiga irregularis*), which spread over the island after the Second World War. Similarly, predation by introduced rats and mangrove monitor lizards (*Varanus indicus*), as well as habitat destruction, disease, and competition with introduced Black Drongos (*Dicrurus macrocercus*), has been suggested as the main cause of the decline in the only other locality where this crow species is found, the small island of Rota, in the Northern Mariana Islands. This population has declined rapidly, and in 2006 it was likely fewer than 500 individuals. A recent study on Rota suggests that the reduction in the population of the crow is not related to predation, but to ectoparasites. The Mariana Crow is considered Critically Endangered.

Another Critically Endangered *Corvus* is the Banggai Crow. This poorly known species was initially discovered in the 1880s, when two specimens were obtained in the Banggai Archipelago, immediately east of Sulawesi. It was not subsequently detected for more than a century. Then, in 1991, an individual was found on the mountain slopes of Peleng, the largest island of the group, suggesting that this species survived on the western side of this island. Concerted follow-up searches conducted in 2004, 2006 and 2007 confirmed that this species did, indeed, survive in the archipelago, but only in forest on the mountain slopes of the western half of Peleng and, in small numbers, at lower levels in the centre of the island. The total numbers present are not known, but very rough estimates suggest that the global population may be between 30 and 200 individuals. Since these observations were made, local conservationists have worked in conjunction with local communities to devise ways in which the crow and its forest habitat can be protected and conserved. It was concluded that assistance should be provided to enable the communities to practise more sustainable agriculture; more efficient methods would mean that the local farmers would not need to clear areas of forest for shifting agriculture. In addition, birds and mammals are hunted for food and other purposes, and it was suggested that the development of ecotourism, a new concept with regard to the forests of this archipelago, might help. The Banggai Archipelago, which consists mainly of small islands and mountains, holds an important range of forest types and reef diversity, which should provide further justification for integrated conservation strategies.

Owing to habitat alteration in its quite small range and a dramatic decrease in its population over recent decades, Stresemann's Bushcrow, the sole representative of the genus *Zavattariornis*, is considered an Endangered species. It is found in an area around Yabello and Mega, in southern Ethiopia, where it inhabits open semi-arid areas of short-grass savanna with scattered low acacia bushes. It is unclear why this species has so restricted a range. Roadside counts carried out in 1989, 1995 and 2003 revealed that the bushcrow's population has decreased by 80% during this period in the Yabello Wildlife Sanctuary. Acacias, important for nest-sites and for foraging, have recently been cut for use as firewood, or to enable the rich soil to be exploited in agriculture, which could explain the population decline of this rare species.

Lidth's Jay occurs only on the islands of Amami-oshima and the nearby tiny island of Kakeroma-jima, in the northern Ryukyu Islands of Japan. This species, known also as the Amami Jay, is considered Vulnerable because its small global population, estimated at about 5800 individuals in the 1970s, is inferred to be declining, possibly as a result of increased levels of predation by the introduced small Indian mongoose (*Herpestes auropunctatus*) and increasing numbers of the Large-billed Crow. In the past, Lidth's Jay was persecuted by local inhabitants through uncontrolled shooting and trapping.



In the 1940s the US Forest Service declared the pinyon-juniper habitat of the ***Pinyon Jay*** *"non-commercial", and set out to eradicate it. Misguided fire suppression policies, disease and drought have taken further toll on this habitat. In consequence, the Pinyon Jay is listed as Vulnerable, because it is thought to have undergone rapid population decline throughout its range. But survey data may be unreliable; the bird is accustomed to irrupting out of its territories when pine nut crops fail, and travelling far beyond its normal range. Some satellite populations are associated with other, less threatened pine species.*

[*Gymnorhinus cyanocephalus*, USA. Photo: Mike Read]



*The habitat of the **Florida Scrub-jay** is being replaced by housing developments and citrus groves, while changes to the natural fire regime have led to overgrowth of scrub and pines, rendering much of the remaining habitat unsuitable. The species is now listed as Vulnerable, with the best estimate for the sum of its fragmented populations being some 6500 birds. Populations along the Atlantic coast of Florida declined at 4% per year between 1992 and 2002, and if the current rate of habitat loss continues, the Florida Scrub-jay could be uplisted to Endangered. Large reserves are needed, with regular fires to ensure that each jay territory has at least 1 ha of low scrub.*

[*Aphelocoma coerulescens*, Florida, USA. Photo: Brian E. Small]

The Pinyon Jay has suffered rapid population declines, apparently as a direct result of the conversion and degradation of its pinyon–juniper woodland habitat, and it is now listed as Vulnerable. It occupies the foothills and lower mountain slopes of the western and south-western USA from central Oregon east to western South Dakota and west Oklahoma, and extends south to northern Baja California, in extreme north-west Mexico. Since the woodland type on which this species depends was classified by the US Forest Service as "non-commercial" and as having "no value", land-managers have followed a policy to eradicate such woodland and to turn the land into cattle pasture. In addition, uncontrolled wildfires have destroyed large areas of suitable habitat for this species in the late 1990s.

Two Middle American jay species are considered Vulnerable by BirdLife, although Mexican conservationists have recently suggested that they should be upgraded to the category of Endangered. The Dwarf Jay is confined to southern Mexico, and is known historically from Veracruz, adjacent to the border with Puebla, and the Sierra Juárez, Aloapaneca and Zempoaltepec, in Oaxaca, where it is particularly abundant in pine–oak–fir forests at 1400–3200 m. Logging for different land uses is leading to widespread habitat destruction or fragmentation and, consequently, the decline of the population of this rare jay. Also with a restricted range in southern Mexico, this time limited to the Sierra Madre del Sur of Guerrero and Oaxaca, the White-throated Jay is locally fairly common to common in tracts of humid montane forest, favouring cloudforest and oak and pine–oak forests at 1525–3500 m. Many of the remaining forests within its range are being cleared for timber and large-scale agricultural expansion, and this is resulting in a decrease in the jay's range and population size, although it has been found in disturbed areas. A third Mexican species with a restricted range is the Tufted Jay, which lives on the Pacific slope of the Sierra Madre Occidental from Sinaloa and Durango south to north Nayarit, where it is fairly common; its known north–south range was recently extended from 210 km to 295 km by records north of Río Presidio. The Tufted Jay lives in canyon forest, which seems not to be susceptible to logging or conversion to agriculture, but, because of its small range, a decline or a fluctuation in its population is possible. It is currently considered Near-threatened.

A further three corvid species are globally threatened and eleven others are considered Near-threatened. The Florida Scrub-jay is entirely restricted to scrub and shrubby areas in Florida, which are being replaced by housing developments and citrus groves. Fire suppression causes scrub to overgrow and the density of pines to increase, rendering the habitat unsuitable for this jay, which is an additional problem. This species is considered Vulnerable because it has a small and fragmented population and range, which is rapidly declining; if the current rate of urban development continues, the consequent loss of range will soon put this species in the category of Endangered. On the other side of the southern USA, the Island Scrub-jay is confined to Santa Cruz, the largest of the California Channel Islands; it has a total population conservatively estimated at 9000 individuals, of which some 7000 are thought to be breeders. It appears not to be under any specific threat, but, because of its tiny global range and the fact



*Little is known about the **White-throated Jay**, and little is likely to be known, unless drastic measures are taken to pull it back from extinction. Already listed as Vulnerable, the population of this restricted-range species from the Sierra Madre del Sur Endemic Bird Area is declining rapidly, as its humid montane forest habitat is cleared for timber and agriculture. The species is found in one protected area, the Omiltemi State Ecological Park, but this needs to be extended, and others established, if this stunning small jay is to survive much longer.*

[*Cyanolyca mirabilis*, Sierra de Atoyac, Guerrero, Mexico. Photo: Manuel Grosselet]



The rich plumage of ***Lidth's Jay*** *once made it a favourite adornment of ladies' hats. More recently it has suffered the depredations of the small Indian mongoose* (Herpestes auropunctatus), *which was introduced to kill Okinawa pit-vipers* (Trimeresurus flavoviridis). *Ironically enough, Lidth's Jay itself eats the young of this aggressive and venomous snake. Lidth's Jay is now fully protected by Japanese law, having been declared a National Monument, and its numbers are rising again, thanks to natural forest regeneration and efforts to control the mongooses. But with a population of less than 6000 and such a tiny range, it is listed as Vulnerable.*

[*Garrulus lidthi*, Amami-Ô-shima, Kagoshima, Japan. Photo: Hirozo Maki]

that the island has been severely degraded by introduced sheep and pigs, the Island Scrub-jay is considered Near-threatened.

The Palm Crow has a moderately small range in the Caribbean, where it is confined to the islands of Cuba and Hispaniola, on both of which it has declined. The cause of its population decrease on Cuba is uncertain, but competition from the Cuban Crow is a possibility; the ranges of the two species have overlapped only since the destruction of the forest habitat. On Hispaniola, widespread forest clearance and also, probably, hunting for food and for sport appear to be the principal causes of its decline. The Palm Crow is currently placed in the category of Near-threatened.

Two Neotropical jays, the Beautiful and Azure Jays, live in forest areas and are sensitive to deforestation. With a decline in their populations, both are considered Near-threatened. The Beautiful Jay occurs along a narrow elevational band of extremely wet foothill and premontane forest on the Pacific slope of west Colombia, south from extreme south Chocó, and north-west Ecuador, south to Pichincha; it is rare and extremely sensitive to human disturbance, and it appears almost exclusively dependent upon primary forest. The Azure Jay is rare to locally common at up to 1000 m in lowland evergreen and southern-temperate (mixed ombrophilous) forests in south-east Brazil from São Paulo south to Rio Grande do Sul, and in north-east Argentina, and there is at least one record from Paraguay; observations suggest that this species is declining substantially, particularly in the west of its range.

In southern Asia, the Sichuan Jay occurs in a comparatively small area of central China, where it is considered rare; it is listed as Vulnerable. It lives in dry coniferous forest of mature spruce (*Picea*) and in mixed fir and rhododendron (*Rhododendron*) forest, often with a poorly developed understorey, at high altitudes of 3000–4270 m; its population is small and severely fragmented as a result of extensive deforestation throughout its range. Forest cover may also be declining on the Qinghai-Tibetan Plateau, because the climate is becoming progressively drier. Biddulph's Ground-jay lives in sandy desert, scrub and areas of desert poplars (*Populus*) in the Taklimakan Desert, in north-west China. This ground-jay was reported as being common in 1929–1930, but was scarce and difficult to locate in the same areas in 1988; this could suggest a population decline, although ground-jays can be very hard to find, even in areas where they are breeding. Nevertheless, degradation of desert habitats through the intensive grazing of goats and camels, extraction of fuelwood and the conversion of huge areas to irrigated land would be possible reasons for this species to have declined. It is currently considered Near-threatened.

The Sri Lanka Blue Magpie, endemic in Sri Lanka, inhabits areas of tall, undisturbed primary forest, a habitat which is under pressure from human activities. It is probable that hunting contributed to its historical decline, but this activity is unlikely to represent a serious threat today. Although many forests within its range are protected, some of these are still subject to degradation and further fragmentation, and forest die-back in the montane region, perhaps a result of air pollution, is also a potential threat. In addition, brood parasitism by the Common Koel (*Eudynamys scolopacea*) is a factor that has possibly contributed to the decline of this magpie species, which is now listed as Vulnerable.

The Andaman Treepie is restricted to the Andaman Islands, where it inhabits areas of dense broadleaf evergreen forest. Although forests in its range remain relatively intact, indications of an increase in human activities in the archipelago may lead rapidly to habitat fragmentation. Clearly, the future of this forest species depends on the enforcing of logging restrictions. It is currently listed as Near-threatened.

Several corvids of south-eastern Asia are Near-threatened. The Crested Jay and the Black Magpie occur in parts of Thailand, Malaysia and Indonesia, the former being found in evergreen forest to 1500 m and the latter in evergreen forest and mangrove to 800 m. Extensive habitat destruction such as that in the Sundaic lowlands, which is so severe that all primary formations are expected to have disappeared by 2010, may cause declines in the populations of both species; the fact that the Crested Jay uses submontane forest and the Black Magpie uses hill forest and forest edge implies, however, that these species are not at immediate risk. Living in a quite restricted area in central Myanmar, the Hooded Treepie is commonly found in dry dipterocarp forest, dry thorn-scrub, secondary growth and the edges of cultivations in the lowlands to 1000 m. Areas of this species' range are now largely cleared for agriculture and the treepie was thought to have suffered a sharp decline, but recent surveys indicate that it remains locally common. As with the previous two species, it is classed as Near-threatened. Placed in the same category, the Brown-headed Crow is confined to the New Guinea region, where its known distribution is highly fragmented, presumably as a result of some unknown habitat specialization; it lives in primary forest and mangroves, occasionally



*The nomadic ways of local pastoralists maintained an ideal habitat for **Stresemann's Bushcrow**, leaving behind them loose, well-dunged soil rich in beetle larvae. Settlement in permanent villages with private land ownership has led to overgrazing and soil compaction. In the Yabello Wildlife Sanctuary the acacias it needs for nesting are being cleared for firewood. Formerly relatively common within its 5000-km² range in southern Ethiopia, roadside counts indicate an 80% decline between 1999 and 2003 alone, and Stresemann's Bushcrow is now listed as Endangered.*

[*Zavattariornis stresemanni*, Yabello Wildlife Sanctuary, Ethiopia. Photo: Ketil Knudsen]

in second growth, but rarely in open areas. Habitat destruction caused by a number of human activities may have led to a decline in the species' population, although it is judged to be reasonably secure in the large areas of forest, with no immediate threats within its range.

Once reasonably common over a fairly wide range in southern Asia, the Collared Crow has recently suffered a contraction in its range and a decrease in its population. This is believed to be due to a loss of food supplies owing to agricultural intensification and the consequent over-use of pesticides, including rodenticides. Moreover, the decline appears to be continuing, and is only made worse in some areas by human persecution, including the use of this crow by children for target practice. The Collared Crow is currently listed as Near-threatened, but it needs to be monitored in case its situation worsens.

Finally, it is important to mention that some corvids, although not listed as threatened or at potential risk, have suffered decreases in their populations as a result primarily of habitat loss and damage caused in particular by agricultural practices. One such example is that of the Red-billed Chough. Many studies have highlighted the ecological needs of this species in low-intensity farmland habitats, such as undisturbed rough grass and short-grazed pasture; data have showed long-term declines with increasing agriculture, and this species is now considered to be vulnerable in parts of its range.

The Arabian Magpie is restricted to juniper forest and well-vegetated wadis in south-west Arabia, where such habitat is under threat from development for tourism, as well as from climatic change, which is producing hotter and drier weather, forcing the remaining population of the magpie into smaller pockets of suitable habitat.



*There were no confirmed sightings of the **Banggai Crow** for more than a century after the species was described from two specimens in the 1880s. Recent surveys indicate that it survives at least on the forested mountain slopes of western Peleng, the largest island in Indonesia's Banggai archipelago. Numbers are likely to be tiny, no more than 200 individuals, and possibly as few as 30. It is listed as Critically Endangered. Conservationists are working with local communities to devise sustainable livelihoods which will protect the bird and its habitat.*

[*Corvus unicolor*, Peleng Island, Indonesia. Photo: Filip Verbelen]



By 1992, there were no more than twelve ***Hawaiian Crows*** *left in the wild. Four years later only three could be found, and the last two failed to return to their traditional nesting site in 2003. The Hawaiian Crow is now considered Extinct in the Wild. The first attempt at a reintroduction of captive-reared birds was abandoned when 21 of the 27 died of predation or disease. Further reintroductions are planned, although the captive group is inbred, which may reduce reproductive success.*

[*Corvus hawaiiensis*, McCandless Ranch, Kealakelua, Hawaii Island. Photo: Jack Jeffrey]

In south-eastern Asia, both the Ratchet-tailed Treepie and the Racquet-tailed Treepie could be at some risk in the near future because of their reliance on lowland forest, a habitat that is becoming increasingly vulnerable. The three species of green magpie in the genus *Cissa* are likewise considered potentially vulnerable; the Common Green and the Indochinese Green Magpies are subject to continued habitat loss due to clearance of lowland forests, and the Short-tailed Green Magpie has a limited range in north Borneo and west Java, where it appears to be uncommon. The Taiwan Blue Magpie, another species with a very restricted range, in this case limited to Taiwan, could also become vulnerable through increased fragmentation of its forest habitat.

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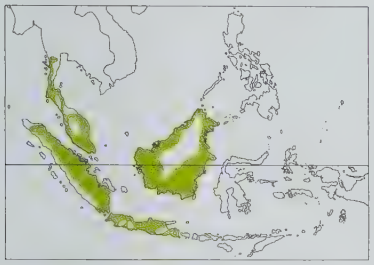
Genus *PLATYLOPHUS* Swainson, 1832

1. Crested Jay

Platylophus galericulatus

French: Geai longup **German**: Haubenhäher **Spanish**: Arrendajo Crestado
Other common names: Malay Jay, Crested Shrike-jay; Malay Crested Jay (*malaccensis*); Sumatran Crested Jay (*coronatus*); Javan Crested Jay (*galericulatus*)

Taxonomy. *Corvus galericulatus* Cuvier, 1816, Java.
Affiliations uncertain, and molecular-genetic studies have not yet shed light on its relationships. Originally allied with shrikes (Laniidae), and has been suggested as being closest to the helmet-shrikes (Prionopidae) and perhaps better placed within that family or with bush-shrikes (Malaconotidae). Unlike other members of present family, has distinctive very long crest, lacks obvious nasal tuft but has long rictal bristles (leaving nostrils exposed), and has spotted and barred juvenile and immature plumages. Until further information becomes available, however, probably best treated as a primitive member of current family. Some confusion has existed over names applied to races; proposed names *scapulatus* and *ardesiacus* (both with vague type localities restricted to Java) are junior synonyms of nominate. Race *lemprieri* possibly part of a cline and perhaps of doubtful validity. Four subspecies recognized.
Subspecies and Distribution.
P. g. malaccensis Cabanis, 1866 – Malay Peninsula.
P. g. coronatus (Raffles, 1822) – Sumatra and most of Borneo (except N).
P. g. lemprieri Nicholson, 1883 – N Borneo.
P. g. galericulatus (Cuvier, 1816) – Java.
Descriptive notes. 31–33 cm; 78–114 g. An unmistakable dark bird with remarkable long crest formed chiefly by two elongated central feathers, tips of which are slightly broader and commonly "nod" forwards, medium-short slightly graduated tail, rather small bill with pronounced hook at tip of upper mandible; nasal tuft vestigial but rictal bristles long and prominent. Nominate race is virtually wholly blackish, apart from conspicuous long white crescent on side of neck and broken small white mark at rear of eye (latter giving white-eyed appearance); tail slightly glossy; iris



reddish to brownish; bill and legs black. Sexes similar. Juvenile is very different from adult, being rufous overall, with head and neck (including short crest) orange-brown, rear crown and upperparts dark rufous-brown, pale buff tips on primary coverts, greater coverts and tertials, chin and throat orange-buff, becoming browner on breast, paling to whitish on lower underparts, iris brown; immature more like adult, but retains small whitish spots at tips of greater coverts and tertials, and dark underparts are finely marked with narrow whitish barring and pale shaft streaks. Races differ mainly in depth of plumage coloration: *malaccensis* is very like nominate but head colour often more sooty, upperparts, including wing and tail, blackish olive-brown, underparts dark slate-grey, nape patches almost joining on nape; *coronatus* is rich tawny-rufous overall, with blackish only around the white of neck crescent; *lemprieri* is similar to last, but slightly paler overall. Voice. Noisy. Contact call (often first indication of species' presence) an excited, almost explosive, staccato chattering rattle, bearing some resemblance to chatter of an excited squirrel (Sciuridae); given in varying degrees of intensity and speed of delivery, and uttered constantly during foraging in forest shrubbery. Also a short "chip" and a reeling note. Presumed song a short, fluty phrase followed by a shrill high-pitched whistle, repeated constantly as the birds move through foraging territory.

Habitat. Lowland broadleaf forest; in hill forest reaches to 750 m in Thailand, 1000 m in Sumatra, and 1800 m in Kelabit highlands of Borneo.

Food and Feeding. Surprisingly poorly known. Diet a variety of invertebrates, including large hairy caterpillars (Lepidoptera), millipedes (Diplopoda), cicadas (Cicadidae), beetles (Coleoptera), grasshoppers and crickets (Orthoptera), wasps (Hymenoptera) and cockroaches (Blattodea). Usually seen singly or in small parties, latter presumably mostly family-based groups; in gloom of dark undergrowth, white neck and eye markings striking and no doubt useful for keeping family close together. Fearless, and will approach humans to within a few metres while uttering shrieking calls, bobbing and weaving, and raising and lowering crest. Otherwise feeds almost entirely inside foliage of bushy growth and in lower to middle canopy of trees.

Breeding. Poorly studied. Season Jun–Jul and Oct–Feb in Java; eggs laid early Feb in Malay Peninsula. Solitary breeder. Well-made nest has foundation and exterior of curly wooden tendrils, with shallow cup, built across lateral branches, close to trunk of major sapling, c. 2–3 m from ground. Clutch usually 2 eggs; no information on incubation and fledging periods.

Movements. Sedentary, as far as is known. May possibly be nomadic to a certain extent, as suggested by trapping at Pasoh research forest (Negeri Semblan), in Peninsular Malaysia, where none was retrapped over 25-month period.

Status and Conservation. Not globally threatened. Currently considerd Near-threatened. Locally not uncommon. Reliance on lowland forest makes it vulnerable to habitat destruction. Although it survives mainly in secondary growth in Malay Peninsula, populations there have dropped considerably; numbers at Pasoh research station had not recovered more than 50% of original loss, even after 25 years of regeneration. Generally uncommon in adjacent Thailand, and not uncommon in Java, Sumatra and Borneo, but forest destruction must have had adverse affect on these populations, too, bearing in mind this species' low tolerance of secondary forest growth.

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Genus *PLATYSMURUS* Reichenbach, 1850

2. Black Magpie

Platysmurus leucopterus

French: Geai à ailes blanches **German**: Trauerelster **Spanish**: Urraca Negra
Other common names: White-winged Magpie(!)/Jay; Black Jay, Black Crested Magpie (*aterrimus*)

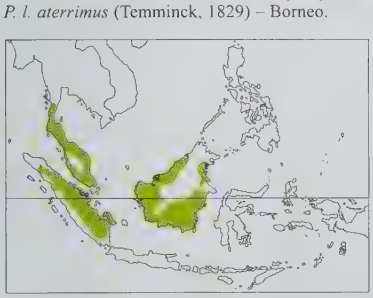
Taxonomy. *Glaucopis leucopterus* Temminck, 1824, Sumatra.

Affinities uncertain; probably one of the most primitive members of the family, but has received remarkably little study. Races well differentiated, and may represent two separate species. Research, including comparative molecular studies, required. Two subspecies currently recognized.

Subspecies and Distribution.

P. l. leucopterus (Temminck, 1824) – Malay Peninsula S from extreme S Myanmar (S Tenasserim) and S Thailand, Bintan (in Riau Archipelago), Sumatra and Bangka I.

P. l. aterrimus (Temminck, 1829) – Borneo.



Descriptive notes. 39–41 cm; 178–182 g. Rather heavily built, black "jay" with moderately long and broad tail strongly graduated, rather short but stout bill with curved culmen; feathers of forecrown stiff, short and blunt, merging into nasal tuft of stiff upcurving bristles, which forms short stiff crest on each side of forehead. Nominate race has almost entire plumage black with weak green sheen, forecrown being particularly glossy; large white wing patch formed by white greater coverts, often tips of median coverts, and outer webs of tertials; iris red; bill and legs black. Sexes similar. Juvenile is duller than adult, more greyish or brownish in tone, with softer plumage, shorter and more stubby crest. Race *aterrimus* lacks white wing patch, and has taller bristly crest than nominate. Voice. Rather noisy, voice often first clue to bird's whereabouts; possibly some geographical differences, but varied vocabulary makes this difficult to assess. Calls of nominate race include harsh chattering of 8–12 notes (not unlike that of *Pica pica*), low hoarse repeated "grraah", repeated metallic ringing note, and rapidly repeated monotone bleat; also a resonating "kon-ting-kalongk" like sound of cow-bell, and xylophone-like "tok-tok telingk-klinkg-klingk". In Borneo, chattering phrase tends to be shorter, of 3–8 gruffer notes. Wings produce low throbbing "boobooboo..." sound in flight.

Habitat. Lowland forest, to 200 m in Peninsular Malaysia and Thailand, and to 800 m on Sumatra, thus chiefly in plains. Equally at home in dry forest, freshwater swamp-forest and peatswamp-forest, preferring mature or well-grown secondary growth, including paperbark trees (*Melaleuca*), and fringes of mangroves. Often around village clearings.

Food and Feeding. Omnivorous. Few details of diet, but species known to be fond of caterpillars (Lepidoptera) and beetles (Coleoptera), and doubtless takes a variety of other invertebrates; seen to dismantle small nests of bees (Apidae) in tree canopy (strongly cushioned forecrown feathering perhaps offers protection against stings). Also takes fruits, and two species of fig (*Ficus*) recorded as eaten. Feeding on small mammals reported. Often in small parties, usually of five or six individuals, keeping inside canopy, usually feeding at middle-canopy level. Very active, seemingly constantly on the move; even when perched has habit of bowing head. Flies between trees in follow-my-leader fashion; often flies over open country to get to next forest area, but does not fly high, preferring to keep within confines of canopy. Often with mixed feeding flocks of smaller birds.

Breeding. Poorly studied. Season Dec and Feb–May in Malay Peninsula; eggs reported in Jun in Borneo. Solitary breeder. Nest a relatively large platform of twigs, with shallow cup lined with finer tendrils, strips of bark and rootlets, rim area sometimes decorated with mosses and flowers, placed 1–8 m above ground inside shrubby cover or in low tree. Clutch 2–3 eggs. No further information.

Movements. Sedentary, as far as is known.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Uncommon throughout range; extinct in Singapore. Reliance on lowland forest makes this species vulnerable to habitat destruction and distributional fragmentation. Nevertheless, its tolerance of secondary growth and the fact that it is often seen around forest clearings with human habitation suggest that prospects for its future survival must be positive.

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Genus *GYMNORHINUS* Wied, 1841

3. Pinyon Jay

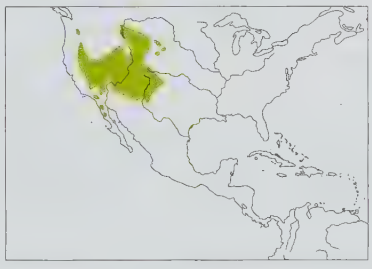
Gymnorhinus cyanocephalus

French: Geai des pinèdes **German**: Nacktschnabelhäher **Spanish**: Chara Piñonera

Taxonomy. *Gymnorhinus cyanocephalus*, Wied, 1841, Maria-River = between Marias River and Yellowstone River, Montana, USA.

Birds from Big Bear Valley (San Bernardino Mts), in California, described as race *rostratus*, but appear inseparable from those in rest of species' range. Monotypic.

Distribution. W USA from C Oregon S along arid mountain slopes of E California to extreme NW Mexico (Baja California), E to Montana and Black Hills of South Dakota, Wyoming, W Nebraska, W Oklahoma and New Mexico.



Descriptive notes. 26–29 cm; male 111 g, female 99 g. A dull blue jay with long sharply pointed bill and short tail. Male is dusty blue above, brighter blue on head, with greyer flight-feathers and black inner webs of primaries; whitish chin and throat slightly mottled darker, underparts like upperparts or slightly paler; iris dark brown; bill and legs black. Female is very like male, but smaller, with crown and cheek duller and paler blue. Juvenile has uniformly mouse-grey body feathers, blue-grey wing and tail feathers, clove-brown inner webs of primaries; immature similar to female but generally duller, and primary inner webs clove-brown. Voice. Well-studied repertoire of at least 15 calls, enabling co-ordination of activities and recognition of individuals; "near-er" calls and juvenile begging calls individually unique, and allow individual recognition of mates, parents and young, and flock-members. "Multiple racks" are graded alarm calls that shift up in pitch frequency with caller's motivation; alarm-call length does not appear to code predator identity, but combination of other calls ("near-er", "racka", "chirr") with alarm "racks" is most frequent in response to aerial predators. Only females "rattle" and "trill"; females and juveniles "chirr" when begging from mates or parents; males give nasal "ran" calls in response to female "rattle". Rambling song can last for 20 or more minutes, and given especially commonly by isolated individuals.

Habitat. Woodlands and forest where pinyon–juniper (*Pinus–Juniperus*), sagebrush (*Artemisia*), scrub oak (*Quercus*) and chaparral dominate; in C Arizona and S California, inhabits areas of ponderosa pine (*Pinus ponderosa*) and Jeffrey pine (*Pinus jeffreyi*). Also enters gardens in cities and towns.

Food and Feeding. An omnivore that specializes on pine seeds for much of year. Adults also eat variety of arthropods, including grasshoppers (Orthoptera), spiders (Araneae), Lepidoptera, beetles (Coleoptera), flies (Diptera), true bugs (Hemiptera) and small lizards. Forages in pine trees on green and ripening cones, harvesting thousands of seeds each autumn; stores seeds up to 11 km away, in small caches a few centimetres below ground; memory of cache sites well developed, allowing birds to feed on seeds throughout autumn, winter and spring. Utilizes seed feeders in gardens. Animal items obtained by feeding on the ground. Often forages in flocks in rolling waves,

On following pages: 4. Blue Jay (*Cyanocitta cristata*); 5. Steller's Jay (*Cyanocitta stelleri*).

walking and flying short distances through woodland, individuals in rear of flock "leap-frogging" to the front. Highly social, living in large co-operative, synchronized flocks of up to 500 individuals throughout year.
Breeding. Season begins early spring, from mid-Feb (even at high elevations), earliest in suburban settings, and may breed in autumn if green cones abundant. Forms socially monogamous permanent pair-bond; bonds lasting for ten years observed in the wild. Nesting colonial and highly synchronized. Co-operative breeding regular, but at low frequency; helping, by sons, apparently confined to a few, very successful family lineages; helpers do not increase reproductive success of parents, but may benefit from extended parental care. Nest built by both sexes, average size c. 111 mm wide × 65 mm deep, an outer platform of sticks, with middle layer of woven coarse grasses, and thick (46 mm) inner cup of finely shredded plant parts, feathers, horsehair and discarded human rubbish, placed in upper half of pine tree. Clutch 2–5 eggs, average 3·7–4·1; incubation by female, period 17 days; chicks fed by both adults, nestling period 21–22 days; fledglings gather in creches, guarded by a few sentries throughout day as adults forage as a flock, parents return approximately every hour to feed young synchronously; young dependent on parents for 2–3 months after fledging. In a well-studied flock, pairs produced 2–3 offspring during their four-year reproductive lifespan; nests fail during early spring snowstorms and are destroyed by variety of mammalian, avian and reptilian nest predators; pairs renest following failure and avoid locations associated with past failure (e.g. exposed sites destroyed by predators or shaded sites destroyed by snow). Females usually begin breeding when 2 years old, males at 3 years. In a well-studied suburban flock, individuals long-lived and fecund; maximum lifespan was 16 years (and male concerned sired ten yearlings).
Movements. Flocks roam widely over large areas (up to 64 km²) and each autumn travel extensively, even nomadically, in search of cone crops. When local cone crops fail, may abandon traditional ranges, settle tens of kilometres away for a year, or wander hundreds of kilometres during autumn and winter; wanders from core range NW to Washington, N to SW Saskatchewan (Canada), E to Kansas and Iowa, S to Texas, and W to coastal California and Santa Catalina I. Most individuals remain in natal flock throughout life, but females and some males disperse to adjacent flocks (3–30 km distant), especially when sex ratio in natal flock skewed in favour of own sex; dispersal of more than 600 km recorded. After nest failure, pairs may move 3–5 km and nest in smaller satellite colonies.
Status and Conservation. VULNERABLE. Locally common. Thought to have undergone rapid population decline throughout its range, apparently as a result of loss of and degradation of its pinyon–juniper woodland habitat; currently, habitat in some areas is dying from disease and drought. Because of the species' nomadic and social lifestyle, however, long-term surveys are unreliable indicators of population size. Ability to exploit bird-feeders in suburban and urban landscapes may allow jays to survive moderate loss of pinyon pine woodland. Various satellite populations exist beyond pinyon pine range in association with small-seeded pines (ponderosa pine; higher elevations of Rocky Mts and Coast Ranges) and agriculture (Idaho, Montana).
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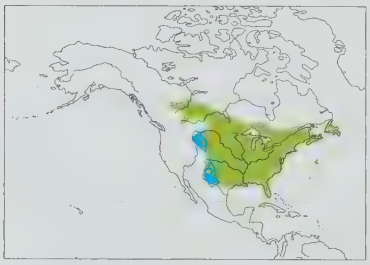
Genus *CYANOCITTA* Strickland, 1845

4. Blue Jay

Cyanocitta cristata

French: Geai bleu **German**: Blauhäher **Spanish**: Chara Azul

Taxonomy. *Corvus cristatus* Linnaeus, 1758, in America septentrionali = south-eastern South Carolina, USA.
Genus closest to *Gymnorhinus* and *Aphelocoma*. Analyses of mitochondrial DNA suggest that this species and *C. stelleri* likely split from a common ancestor over 5 million years ago (cytochrome *b* gene divergence of 10·7%). Known to hybridize with *C. stelleri*, and also with *Aphelocoma coerulescens* and *Cyanocorax yncas*. Geographical variation rather weak and clinal, and *semplei* perhaps better subsumed in nominate; review desirable. Four subspecies currently recognized.
Subspecies and Distribution.
C. c. bromia Oberholser, 1921 – S Canada from E British Columbia E to Newfoundland, S in USA from North Dakota to NE Nebraska and C Missouri and, in E, to SC Illinois, C Indiana, NE Kentucky, NE Tennessee and SC Virginia.
C. c. cyanotephra Sutton, 1935 – from SE Wyoming and Nebraska (except NE) S through E Colorado, W Kansas and Oklahoma to N Texas.
C. c. cristata (Linnaeus, 1758) – from S Missouri, S Illinois, SW Indiana, W Kentucky, Tennessee (except extreme NE), SW Virginia and North Carolina S to SE Texas, coastal Gulf of Mexico and C Florida.
C. c. semplei Todd, 1928 – S half of Florida (S from Hillsborough and Osceola counties).



Descriptive notes. 25–30 cm; 70–100 g. Small jay, blue, white and black with distinctive but short erectile crest, medium-long graduated tail, and grey to blue rictal bristles covering nostrils. Nominate race is dull blue above, often with purplish wash, crest purple-blue; facial area and throat grey to white, narrow black collar extends upwards to form black band on nape, black eyestripe joining black lores to black nape; bluish-white nasal tuft; upperwing and tail bright sky-blue, marked with narrow black bars and white tips (especially prominent white tip of tail in flight); breast and flanks grey, fading to white on vent; iris dark brown; bill and legs black. Sexes similar, male slightly larger than female. Juvenile has blue areas of plumage greyer, especially on back, nape and crest, white tips of tail more restricted, black markings browner than those of adult, barring on wing-coverts less distinct, bars on secondaries and tail less regular, and legs and feet paler and greyer. Race *bromia* is largest, is darker and brighter blue above than nominate, more extensive white markings on wing and tail; *cyanotephra* is intermediate in size between previous and nominate, with dull pale blue upperparts without purplish wash, extensive white in wing and tail; *semplei* is small, and said to be more white than grey on breast and flanks, less blue on lower throat, and paler, duller and less purple above than nominate, with soles yellow (not black). VOICE. Large vocabulary of graded calls, divided into five broad categories. (1) "Jeers" are harsh, loud, harmonically structured calls used for assembly, mobbing and perhaps as contact; extensive gradation in intensity, higher-pitched and louder calls probably associated with increasing degree of alarm. (2) "Pump-handle" calls are clear, musical, multisyllabic whistles like sounds made by handpumps, pulleys and squeaky gates, and often used to indicate low-intensity alarm. (3) Contact calls between mates are soft, guttural clucks, "chuck" notes, and, when excited, "whines"; begging calls included in this group. (4) "Rattle" calls are series of rapid, dry, raspy clicks, often given by excited females. (5) Other calls include noises made when swallowing food, "squacks", soft song, and "peeps". Extensive mimicry, especially of raptors.
Habitat. Forest and woodland, whether coniferous, deciduous or mixed, with openings and extensive edge. Closely associated with mast-bearing trees, especially oaks (*Quercus*); common in towns where mast trees planted. Utilizes shelter-belts and human settlements across Great Plains.
Food and Feeding. Omnivorous, but seasonal specialist on mast crops. Large sample of stomach contents from 1920s contained 22% insects, 43% hard mast (mostly acorns, but also beechnuts, hickory nuts and hazelnuts), 7% wild fruits, and traces of cultivated grain, fruit, and bird eggs and nestlings. Other small vertebrates known to be taken are mice (Muridae), bats (Chiroptera), frogs, lizards; carrion eaten, especially in winter. Each individual caches thousands of nuts each autumn from areas within 4 km of breeding site; small groups of nuts (2–5 acorns, 15 beechnuts) transported in throat, oesophagus and bill from harvest site to cache area, where individually buried within a few metres of each other; spatial memory of this corvid well developed, and likely an important adaptation allowing efficient cache recovery. Sophisticated forager, known to form search images and to use vegetative characteristics to aid detection of cryptic prey, to switch foraging patches after prey locally depleted, and to make tools to obtain items otherwise out of reach (in the laboratory). Found mostly in pairs or family groups in spring and summer, but often in small flocks (up to 30 individuals) at reliable food sources or when harvesting mast during autumn and winter.
Breeding. Nest-building begins in mid-Mar, and laying from early Apr in S to mid-May in N of range. Long-term socially monogamous pair-bond. Solitary breeder, non-territorial; dominance interactions between neighbours subtle. Male collects most of nest material, but female does most of building work and may select nest-site; nest a bulky structure with coarse outer platform (17–21 cm diameter, 10–12 cm deep) of fresh twigs, lichens, moss and, when available, bits of rubbish and debris (including paper, plastic, string, cloth), layer of mud on coarse sticks is lined with rootlets and sometimes partially decomposed leaves, inner cup 8·5–10·5 cm wide and 6 cm deep; placed 1–30 m or more above ground in tree or, rarely, in shrubs or on building. Clutch 2–7 eggs, typically 4–6 in N range and 3–4 in Florida; incubation by female, fed on nest by male, period 17–18 days; chicks brooded by females for 8–12 days, nestling period 17–21 days; juveniles disperse from family group c. 2 months after fledging, dispersal behaviour poorly known, but confirmed natal dispersal of 2–3 km. Recorded longevity 18 years in the wild and 26 years in captivity; annual survival rates c. 50%.
Movements. At least some individuals resident in all parts of range. Except in extreme S, up to probably not more than 20% of population migratory; N race *bromia* makes post-breeding movement S through Oregon, E Texas, S Louisiana, C Alabama and NE Georgia. Autumn migration primarily from mid-Sept to late Oct and often concentrated along major rivers; one instance of offshore migration along barrier islands of Gulf Coast resulted in large mortality. Spring passage primarily from late Apr to late May, less conspicuous and less concentrated along major rivers than autumn migration. Migrates in small groups or loose strings mainly along SW–NE axis, during day, and from treetop level to 300 m above ground; sometimes forms large flocks of hundreds of individuals during migration. In winter some vagrants or migrants seen irregularly outside normal range, especially during "invasion" years when acorn crops fail, e.g. in 1976–1977 and 1990–1991 recorded W to S British Columbia, W Washington, W Oregon and N California; irregular Montana, Idaho, WC Nevada, Utah, Arizona, New Mexico and W Texas. Two reports from Bermuda.
Status and Conservation. Not globally threatened. Common throughout range. Density variable with habitat, 7–28 pairs/100 ha; densities in towns may exceed those in forested areas. Has bred once in Oregon (Union County). Range extensions to W increasingly common since 1970s, and often associated with small towns, cities and other human activities. Slight decline (1·7% from 1966 to 1996) in E of range. Susceptible to West Nile Virus, which locally depleted some E populations during 1999–2002 and resulted in a region-wide decline of up to 26%, before numbers recovered in 2005. Ability of most yearlings to breed when local population density is low may allow this species to recover rapidly from years of exceptionally high mortality.
Bibliography. Bancroft & Woolfenden (1982), Beal (1918), Bock & Lepthien (1976), Callo (1977), Clements (1990), Cohen (1977), Coles (1986), Conant (1972), Curry *et al.* (2002), Edwards (1969), Emslie (1998), Engels & Sexton (1994), Ericson *et al.* (2005), Espinosa de los Monteros & Cracraft (1997), Goodwin (1986), Graber *et al.* (1987), Gross (1982), Gutkin (1978), Hailman (1990), Hardy (1961), Hardy & Wheat (1982), Heinrich (1988a), Hickey & Brittingham (1991), Johnson & Webb (1989), Jones & Kamil (1973), Kamil, Lindstrom & Peters (1985), Kamil, Yoerg & Clements (1988), LaDeau *et al.* (2007), Laine (1981), Laskey (1973), Loftin (1991), Madge & Burn (1994), McGraw *et al.* (1993), Oberholser (1921), Peterson (1991d), Sauer *et al.* (1997b), Saunders & Edwards (2000), Smith (1978, 1986), Smith & Scarlett (1987), Tarvin (1998), Tarvin & Woolfenden (1997, 1999), Van Horn (1978), Yoerg & Kamil (1988).

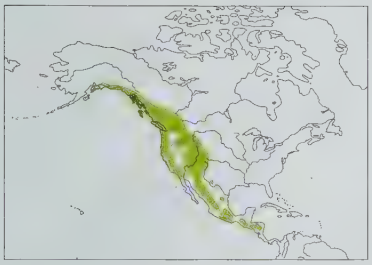
5. Steller's Jay

Cyanocitta stelleri

French: Geai de Steller **German**: Diademhäher **Spanish**: Chara de Steller

Taxonomy. *Corvus stelleri* J. F. Gmelin, 1788, in Sinu Natka Americae borealis = Nootka Sound, Vancouver Island, British Columbia, Canada.
Genus closest to *Gymnorhinus* and *Aphelocoma*. Analyses of mitochondrial DNA suggest that this species and *C. cristata* likely split from a common ancestor over 5 million years ago (cytochrome *b* gene divergence of 10·7%). Occasionally hybridizes with *C. cristata*. Race *suavis* intergrades with *lazula*; latter poorly differentiated, possibly better merged with *ridgwayi*; also, *teotepecensis* and *ridgwayi* subsumed in *coronata* by some taxonomists. Sixteen subspecies currently recognized.
Subspecies and Distribution.
C. s. stelleri (J. F. Gmelin, 1788) – S Alaska and coastal British Columbia S to NW Oregon.
C. s. carlottae Osgood, 1901 – Queen Charlotte Is (off British Columbia).
C. s. annectens (S. F. Baird, 1874) – Rocky Mts of interior British Columbia and SW Alberta (Canada) S in USA to E Washington, Idaho, Montana, E Oregon and Wyoming.

C. s. frontalis (Ridgway, 1873) – C Oregon S through mountains to E California and WC Nevada.
C. s. carbonacea Grinnell, 1900 – N California (counties of Marin, Contra Costa and Monterey).
C. s. macrolopha S. F. Baird, 1854 – S Rocky Mts from SW South Dakota S to Utah, Nevada, Arizona and New Mexico, E to Nebraska and W Texas, and S to N Mexico (N Sonora and Chihuahua).
C. s. diademata (Bonaparte, 1850) – Sierra Madre Occidental from SE Sonora and SW Chihuahua S to Durango and Jalisco; also E Nuevo León.
C. s. phillipsi Browning, 1993 – C Mexico (SC San Luis Potosí).
C. s. purpurea Aldrich, 1944 – SC Mexico (N & C Michoacán).
C. s. coronata (Swainson, 1827) – E Mexico (SE San Luis Potosí and N Veracruz S to Puebla).
C. s. azteca Ridgway, 1899 – WC Veracruz S to México, Morelos and W Puebla.
C. s. teotepecensis R. T. Moore, 1954 – high mountains of C & S Guerrero, in S Mexico.
C. s. restricta A. R. Phillips, 1966 – Oaxaca, in S Mexico.
C. s. ridgwayi W. deW. Miller & Griscom, 1925 – highlands of SE Mexico (Chiapas) and adjacent Guatemala.
C. s. lazula van Rossem, 1928 – El Salvador and SW Honduras.
C. s. suavis W. deW. Miller & Griscom, 1925 – highlands of E El Salvador, Honduras and N Nicaragua.



Descriptive notes. 30–34 cm; 100–142 g. A robust, vibrant blue-and-black jay with flashy crest that is erected to convey dominance and aggression; short, stout bill slightly hooked at tip. Male nominate race has dark bluish-black head and crest, small light blue streaks on forehead; neck and mantle bluish-black, upperwing dark blue with thin black barring, tail indigo with narrow black barring; throat paler blue and grey-streaked; upper breast dark blue-grey, rest of underparts blue; iris dark brown; bill and legs black. Female is similar to male but slightly smaller, with narrower and less prominent barring on wing and tail. Juvenile differs from adult in having shorter crest which lacks stripes, pale blue wings and tail, greyer underparts, and pale bill. Races differ mainly in size and coloration, N races with head, crest and back black, most S races with these areas blue, S races also smaller: *carlottae* is largest and darkest, head and crest jet-black, mantle and back also black, body colour variable, mostly light to dull blue or purple, distinct barring on wing and tail; *annectens* is similar to nominate, but has silvery spot above eye, greater contrast between blue mantle and back and black-blue head and crest; *frontalis* has greyish-black head to back, crest with blue-tinged top, blue streaks on forehead extend over crown; *macrolopha* has jet-black face and long glossy black crest contrasting sharply with grey mantle and back, large grey throat patch extending to upper breast, distinct white stripe over eye and white spot below eye; *carbonacea* has black crest, no white spot over eye, blackish-grey upperparts, contrasting sky-blue underparts; *diademata* has white to blue-white forehead spots, grey back, long jet-black crest, sky-blue underparts; *phillipsi* has blue crest with long pale stripes at front, dull blue upperpart and underparts; *purpurea* has deep blue crest, blue to ultramarine-blue mantle and back, small grey throat patch, grey ventral area blending to dark blue undertail; *coronata* has long blue crest, whitish-purple marks on front of crest and crown, black cheeks and face contrasting with ultramarine-blue upper throat, and greyish-blue back with light blue rump; *azteca* has black crest, cheeks and throat contrasting with grey-blue mantle, extensive white above and below eye, purplish-blue wings and tail; *teotepecensis* resembles *purpurea* but is less purple, with crest richer blue, and has conspicuous white throat patch; *restricta* has short blue crest with pale blue at front, and light blue body; *ridgwayi* has ultramarine-blue crest, purplish-white forehead streaks, distinct grey-white throat, white patches above and below eye, and mostly dull blue body; *lazula* closely resembles previous, from which possibly not distinct; *suavis* has ultramarine-blue crest and back, pale blue throat and underparts, small greyish throat patch. Voice. At least twelve distinct calls, along with flock-specific calls and frequent mimicked sounds (e.g. of other animals, especially raptors). Many guttural notes given at close range. "Aap" calls are given in variety of social contexts and vary in intensity, likely indicating caller motivation; at highest intensity, associated with agonistic wing-spreading behaviour. "Wek" calls are strung together in sequences of up to five per second, call rate graded to indicate aggression and alarm. "Wah" calls and "growls" indicate aggression and may be used during mobbing. Only male gives "creak" note, often in association with female-specific "rattle" call. Whistles, gurgles, snaps, pops, and harsh notes are combined into songs often lasting several minutes, and rendered mostly by males.

Habitat. Forests and woodlands, including deciduous forest, temperate rainforest and humid coastal forest with Sitka spruce (*Picea sitchensis*), western red cedar (*Thuja plicata*), redwood (Cupressaceae), fir (*Abies*) and hemlock (*Tsuga canadensis*) from Alaska S to W California; dry ponderosa pine (*Pinus ponderosa*) and lodgepole pine (*Pinus contorta*) forests and pinyon–juniper (*Pinus–Juniperus*) woodlands of Rocky Mts and isolated western ranges; mixed conifer, oak (Quercus), and eucalypt (*Eucalyptus*) forests in coastal California; pine–oak woodlands from SW USA S to Central America. Common around homes in wild and suburban settings; frequents picnic and camping areas in forested landscapes. Most abundant in fragmented, patchy forested landscapes including rich mosaics of variously aged forests with little or no human settlement; at lower densities in settled landscapes, even those with small towns and suburbs.

Food and Feeding. Omnivorous. Takes fruits, seeds, berries, arthropods, small vertebrates, and discarded household scraps (e.g. bread, meat); preys on nestlings and eggs of other birds incidentally while foraging for common food items (arthropods and plant material), eggs may be especially important early in nesting season. Routinely takes offerings at feeders, especially during autumn and winter. Caches surplus food and, where available, harvests large seeds of pinyon and whitebark pine (*Pinus albicaulis*), which it transports up to 3 km and stores mostly as single seeds; pine seeds and acorns likely recovered during late autumn and winter. Finds own caches by using spatial memory; pilfers caches made by other birds and mammals by observing them when they cache and remembering the location. Forages on ground and in vegetation. Lives mostly in pairs, or in family groups for a few months, but may form flocks at locally abundant food sources outside breeding season. Associates with *Aphelocoma* jays and *Gymnorhinus cyanocephalus* during autumn and winter in SW USA.

Breeding. Nest-building begins in Mar and reaches peak in Apr throughout C of range, eggs mid-Mar to mid-Jul. Pair-bond appears stable and permanent, but not studied in depth. Defends small area of dominance near nest. Nest built by both sexes, a bulky structure with coarse twig outer platform 25–43 cm wide and 15–18 cm tall, middle layer of mud and plant material, and lining of pine needles, rootlets and hair (11–13 cm in diameter, 6–9 cm deep), placed 2–25 m above ground in central, dense part of tree, or on artificial structure e.g. roof support or outbuilding wall; may interrupt nest-building if mud unavailable. Clutch 2–6 eggs, mean 3 (often 4 in first nest of season); incubation by female only, fed on and off nest by male, period 16 days; chicks fed by both parents, nestling period 16 days; young fed by both adults for 1–2 months after fledging. Success rate in mostly forested landscapes high, e.g. 16 of 25 pairs fledged 1–5 offspring (mean 2·9 fledglings) in Washington temperate rainforests, but in nearby suburban landscapes low (1 of 9 nests fledged young). Age of first breeding likely 2–3 years. Maximum recorded lifespan in wild 16 years.

Movements. Resident. May make eruptive movement in poor food years or migrate seasonally from high to lower elevations. Movements of 50 km unusual, but occasionally recorded E into Saskatchewan and Quebec (Canada), South Dakota, Illinois, Kansas and Texas, and S into Baja California (NW Mexico).

Status and Conservation. Not globally threatened. Common. Most populations appear locally stable or increasing slightly. Lives in variety of human-dominated landscapes, including those with urbanization and where lands used for forestry, where it thrives in mature forest as well as edges and patchy regenerating forest. Routinely visits bird-feeders, but density and reproduction lower in suburban areas than in nearby mostly forested areas. Threatened with extirpation in El Salvador owing to habitat loss. In temperate portions of range may pose a conservation threat to other, rarer birds by preying on eggs and nestlings, e.g. those of Marbled Murrelet (*Brachyramphus marmoratus*) in far NW of range.

Bibliography. Bekoff *et al.* (1998), Brown (1963b, 1963c, 1964), Browning (1993), Burg *et al.* (2005), Burnell & Tomback (1985), Curry *et al.* (2002), Ericson *et al.* (2005), Espinosa de los Monteros & Cracraft (1997), Greene *et al.* (1998), Hardy & Wheat (1982), Hope (1980), Howell & Webb (1995), Klicka & Zink (1997), Komar (1998), Marzluff *et al.* (2004), Raphael *et al.* (2002), Saunders & Edwards (2000), Sieving & Willson (1999), Thayer & Vander Wall (2005), Vander Wall & Balda (1981), Vigallon & Marzluff (2005a, 2005b), Westcott (1969).


inches 4
cm 10
PLATE 30
ssp californica
ssp sumichrasti
ssp woodhouseii
6
7
8
9
ssp ultramarina
ssp wollweberi
ssp guerrerensis
10
ssp unicolor
ssp quindiuna
11
ssp jolyaea
12
ssp armillata
ssp viridicyanus
13
14
ssp mitrata
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ssp cucullata
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Genus *APHELOCOMA* Cabanis, 1851

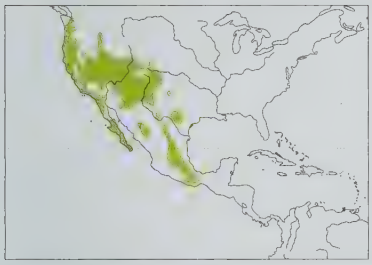
6. Western Scrub-jay

Aphelocoma californica

French: Geai buissonnier **German**: Kalifornienhäher **Spanish**: Chara Californiana
Other common names: Scrub/California Jay; California Scrub-jay ("nominate group"); Woodhouse's Scrub-jay ("*woodhouseii* group"); Sumichrast's Scrub-jay (*sumichrasti*, *remota*)

Taxonomy. *Garrulus californicus* Vigors, 1839, Monterey = Monterey County, California, USA. May form a superspecies with *A. insularis* and *A. coerulescens*, and the three previously treated as conspecific. Relationships of this group with *A. ultramarina* and *A. unicolor* yet to be resolved, as recent studies indicate that divergence of these three major lineages within the genus was apparently rapid, leading to conflict among genetic markers. Present species hybridizes with *A. coerulescens* in captivity and may perhaps hybridize with *Cyanocitta stelleri* in the wild. Subspecies fall into three fairly well-defined groups, "nominate group" (incorporating also *immanis*, *caurina*, *oocleptica*, *obscura*, *cana* and *hypoleuca*), "*woodhouseii* group" (incorporating also *nevadae*, *texana*, *grisea* and *cyanotis*), and "*sumichrasti* group" (with *remota*); these possibly represent three distinct species. Race *cana* is possibly merely a hybrid between nominate race and *obscura*; *immanis*, *caurina* and *oocleptica* sometimes subsumed in nominate. Proposed race *cactophila* (from C Baja California, in NW Mexico) synonymized with *hypoleuca*; birds from SC USA and NC Mexico described as *suttoni*, but considered inseparable from *nevadae*. Fourteen subspecies currently recognized.

Subspecies and Distribution.
A. c. immanis Grinnell, 1901 – NW USA (W Washington, coastal and interior Oregon).
A. c. caurina Pitelka, 1951 – from coastal S Oregon S to California (Napa and Sonoma Counties, and E to inner Coast Ranges).
A. c. oocleptica Swarth, 1918 – SC Oregon S to interior C California (including Sacramento and San Joaquin Valleys and adjacent Coast Ranges S to San Francisco peninsula), Sierra Nevada foothills and E to W Nevada.
A. c. californica (Vigors, 1839) – Coast Range of C California (from San Mateo County and SE Alameda County S to SW Ventura County).
A. c. obscura Anthony, 1889 – SW California (highlands of Mojave Desert) and extreme NW Mexico (N Baja California).
A. c. cana Pitelka, 1951 – Eagle Mt, in Joshua Tree National Park (SE California).
A. c. hypoleuca Ridgway, 1887 – C & S Baja California.
A. c. nevadae Pitelka, 1945 – interior SW USA (throughout Great Basin, mountains in Death Valley and Mojave Desert, and SW New Mexico) S to N Mexico (NE Sonora and NW Chihuahua).
A. c. woodhouseii (S. F. Baird, 1858) – foothills of Rocky Mts from Utah and S Wyoming S to N Arizona and Colorado, E to W Oklahoma and Texas (including Big Bend), and N Mexico (N Chihuahua).
A. c. texana Ridgway, 1902 – Edwards Plateau (WC Texas).
A. c. grisea Nelson, 1899 – NW Mexico (Sierra Madre Occidental, mostly in Chihuahua).
A. c. cyanotis Ridgway, 1887 – E Mexico (lower Sierra Madre Oriental).
A. c. sumichrasti (Ridgway, 1874) – S Mexico (Distrito Federal E to Veracruz, Oaxaca and Isthmus of Tehuantepec).
A. c. remota Griscom, 1934 – SW Oaxaca and C Guerrero, in S Mexico.



Descriptive notes. 28–30 cm; 70–100 g. Small, crestless jay with long tail, plumage blue, grey and white; bill varies from stout, short and hooked (where populations rely on acorns) to long, tapered and sharp (where seeds of pinyon pine consumed). Nominate race has crown and neck deep violet-blue, ear-coverts dark grey suffused with blue, narrow white supercilium, grey-streaked white throat, nearly complete blue collar below throat; mantle dull greyish-brown, rest of upperparts bright blue, upperwing and tail dark dull blue; breast grey, rest of underparts white, undertail-coverts (especially longest ones) tinged with blue; iris brown; bill heavy and hooked (acorn-eater), black; legs black. Sexes similar, female slightly paler and duller than male. Juvenile differs from adult in having grey to brown head with only slight superciliary stripe, less pronounced white throat, barely discernible collar, and shorter bill. Races differ mainly in depth of coloration, "nominate group" (nominate and first six below) generally brightest and darkest, with most distinct supercilium, "*woodhouseii* group" duller and lighter blue with less distinct collar and less contrast between dull blue hood and grey-brown back, also generally larger but bill smaller, and "*sumichrasti* group" (last two below) largest and palest, with supercilium and breastband barely discernible: *immanis* is larger than nominate, but with proportionately shorter wing and tail, less purple overall and back brown more than grey, dark blue dorsal plumage contrasts strongly with ventral white, undertail-coverts of most males tinged pale blue or grey; *caurina* is similar to nominate in size and plumage, but more purple (especially on head), darker grey back, and darker smoke-grey breast; *oocleptica* is larger than nominate, dark in W of range, paler in E (where purple less pronounced, especially around head), undertail-coverts mostly white, only few individuals having blue tinge; *obscura* is smaller and darker (with more purple) than nominate, throat more heavily streaked, undertail-coverts often tinged with blue, and wing and tail brighter blue; *cana* is smaller and duller than nominate, with bill less heavy (exploits small pine seeds); *hypoleuca* is smaller and lighter coloured (with less purple) than nominate, with paler back, whiter belly, bill proportionately longer than that of others in group; *woodhouseii* has head and neck dull blue, back brownish-grey, abdomen grey, undertail-coverts bluish-grey, tapered, pointed bill; *nevadae* has head and neck duller blue than last, long narrow bill with little or no hook (reliance on pinyon pine seeds); *texana* has slightly darker blue plumage than *woodhouseii*, with narrow but contrasting collar between white throat and upper breast, browner breast, whiter belly, large white area around cloacal region, bill heavier and more hooked, juvenile paler than *woodhouseii*; *grisea* is lighter overall and larger, with longer wing and shorter bill than *woodhouseii*, slight collar, white undertail-coverts; *cyanotis* is similar in size to previous, has blue duller and less purple than *woodhouseii*, back mostly brown and supercilium faint, undertail-coverts white, sometimes tinged grey, wing longer and bill shorter and heavier than *woodhouseii*, juvenile pale and browner on breast than *texana*; *sumichrasti* is very large, has bright blue head and neck, velvety black auriculars, reduced white supercilium, dark grey-blue wings and tail, bright blue uppertail-coverts, chin to mid-breast streaked pale grey, faint collar, heavy bill with short hook; *remota* is similar to last but slightly larger, with duller and lighter blue plumage, greyer and lighter back, and even less evident collar. Voice. Large repertoire of at least 15 call notes, begging, and soft song. Courting and solitary individuals sing. Territory defended with "weep", "screlch", "shlenk" and "nhyuk" calls. Predators mobbed with "scold", "zeep", "zraanh" and "shlank" calls. At high intensity, "distress screech" used in mobbing. Males give "chuk" and females "rattle" during territorial interactions. Partners communicate with "wheeze", "snarl", "kuk", "poit" and "wah" calls. Further study required, including details of geographical, motivational, contextual and individual variation.

Habitat. Mixed oak (*Quercus*), pine (*Pinus*) and juniper (*Juniperus*) woodlands, scrublands, chaparral, and brushlands; reliant on acorns or large seeds of pinyon pine that occur throughout these habitat types. Exceptions to close association with pines and oaks are notable: pure mountain mahogany (*Cercocarpus*) shrubland and chaparral in California, Nevada and Oregon; pure juniper in S Wyoming, Oregon and Idaho; high montane pine–spruce (*Pinus–Picea*) forests in N Baja California (Sierra San Pedro Mártir); desert riparian and cactus forest in S Chihuahuan Desert; palmetto and thorn-scrub in Oaxaca; and mangrove (*Rhizophora mangle*, *Laguncularia racemosa*, *Avicennia germinans*) swamps in Bahía de Magdalena region of S Baja California. Able to thrive in human-dominated areas if shrubs or trees available, and if feeders, cultivated grains and fruits, poultry eggs or household scraps provided.

Food and Feeding. Omnivorous, but seasonal specialist on pine and oak crops throughout most of range. Takes fruits, seeds, invertebrates, small vertebrates including mice (Muridae), lizards, snakes, small birds and nest contents, also carrion and, where available, discarded scraps and other household fare. Large sample of stomach contents from early 1900s in agricultural area of California contained 38% acorns, 23·5% insects, 22% fruit including cultivated cherry and plum (*Prunus*) and wild elderberry (*Sambucus*), 12% grain (mostly oats and corn), 3·5% small vertebrates (small mammals, reptiles, amphibians, bird eggs and nestlings). Stomach analyses and observational studies in Arizona and California confirm importance of acorns in diet. Stores acorns and pine seeds within territory, or in home range (of non-territory-holding "floaters"), for use throughout winter and early spring, caching 5000–7000 seeds each autumn; on each trip from harvest to caching grounds transports a few seeds (1–5) in mouth or bill 1–500 m, and usually one seed at a time cached in ground. Uses spatial memory to recover seeds, but landmarks and sun-compass may be used to orient to caches. Experienced cachers, which have pilfered caches of others, avoid possible loss of own caches by moving them when observed; when storing perishable and non-perishable items, recovers perishable items first. Forages on the ground and in shrubs. Mostly in pairs or, for brief post-fledging period, in family groups. Floaters may form small aggregations of 5–15 individuals (in Arizona) or up to 30 (California), within moderate-sized home range (average 21 ha), but membership of these flocks changes frequently.

Breeding. Nest-site selection and start of nest-building in late Feb to early Mar in N California, and laying from late Mar to early Apr; repeated nesting after failure, occasionally second broods, or possible late nests (when acorn crops superabundant) can result in active nests as late as Sept. Long-term socially monogamous pair-bond. Single pair defends all-purpose territory, using combination of flight and vocal displays; territory size varies, but generally small, 0·7–6·5 ha. In N Oaxaca (S Mexico), more than 60% of territories (mean size 1·5 ha) defended by groups of 2–6 adults, which exhibit co-operative behaviour, including feeding of fledglings; helpers at nest rare in this co-operative population, in which singular breeding the norm. Bulky nest has coarse outer platform 15 cm in diameter and 9 cm deep, of twigs and rootlets, lined with plant fibre, rootlets and animal hair, inner cup 10 cm wide and 5 cm deep, placed 2–4 m above ground in tree, vines or shrub. Clutch 1–5 eggs (typically 4–5 in N of range, 2–3 in Baja California); incubation by female, fed by male, period 16–18 days; chicks brooded by female, nestling period 17–24 days; juveniles disperse from family group c. 6–9 weeks after fledging. Success rate in California typically high, and older breeders more successful than naive ones, but average productivity of 0·84 independent young per pair per year. Longevity in wild at least 15 years 9 months; average annual survival rates in California 83% for males and 78% for females.

Movements. Resident throughout range. Pairs may wander to harvest nuts and other food bonanzas; floaters may generally move to more productive feeding locations or lower elevations during autumn and winter. In N Arizona and New Mexico, large numbers may move to lower-elevation desert shrublands and riparian areas during winter; in California, some territories abandoned after mast-crop failure (half are then reoccupied by previous owners during breeding season). Irruptive movements following poor acorn and pine-seed production occasional, coincident with those of other seed-eating corvids. Dispersal of ringed and radio-tagged individuals studied in N California: males disperse farther than females, and many birds breed within 6 km of natal territory; others traverse longer distances (at least 40 km) before settling to breed.

Status and Conservation. Not globally threatened. Common throughout range; rare in Eagle Mts of California, where race *cana* listed as a California species of special concern. Populations stable to slightly increasing where annually assessed, i.e. 1% annual increase from 1966 to 2000 in N of Mexico. Distribution on W coast has been moving gradually northwards. Vulnerable to exotic diseases, which are increasingly common within this species' range; these include West Nile Virus, which is deadly to most corvids. Vulnerable also to effects of Sudden Oak Death and loss of pinyon woodlands to drought and fungus, which can reduce oak and pine mast.

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On following pages: 7. Island Scrub-jay (*Aphelocoma insularis*); 8. Florida Scrub-jay (*Aphelocoma coerulescens*); 9. Mexican Jay (*Aphelocoma ultramarina*); 10. Unicoloured Jay (*Aphelocoma unicolor*); 11. Black-collared Jay (*Cyanolyca armillata*); 12. White-collared Jay (*Cyanolyca viridicyanus*); 13. Turquoise Jay (*Cyanolyca turcosa*); 14. Beautiful Jay (*Cyanolyca pulchra*); 15. Azure-hooded Jay (*Cyanolyca cucullata*); 16. Black-throated Jay (*Cyanolyca pumilo*); 17. Dwarf Jay (*Cyanolyca nanus*); 18. Silvery-throated Jay (*Cyanolyca argentigula*); 19. White-throated Jay (*Cyanolyca mirabilis*).

7. Island Scrub-jay

Aphelocoma insularis

French: Geai de Santa Cruz **German**: Inselhäher **Spanish**: Chara de Santa Cruz
Other common names: Santa Cruz Jay

Taxonomy. *Aphelocoma insularis* Henshaw, 1886, Santa Cruz Island, California, USA.
May form a superspecies with *A. californica* and *A. coerulescens*, and the three previously treated as conspecific; present species derived from coastal clade of former. Relationships of this group with *A. ultramarina* and *A. unicolor* yet to be resolved, as recent studies indicate that divergence of these three major lineages within the genus was apparently rapid, leading to conflict among genetic markers. Monotypic.
Distribution. Santa Cruz I (SW California), in SW USA.



Descriptive notes. 33 cm; male 100–147 g, female 100–117 g. Smallish, crestless, long-tailed jay, primarily grey-blue in colour, with disproportionately large bill, broad head, long legs. Male has dull ultramarine-blue crown, nape, upperwing and tail, contrasting white chin, throat and upper breast, nearly complete blue collar below throat; black face, thin white supercilium; upperparts dark brownish-grey with blue tinge; lower breast and below greyish, bluish undertail-coverts; iris brown; bill and legs black. Differs from *A. coerulescens* mainly in larger size, relatively larger bill, longer legs, deeper blue coloration and darker brown back. Female is is like male, but paler. Juvenile is brownish-grey with blue-tinged crown and dark dull blue wings and tail; immature similar to adult, except that greater primary coverts edged brown, outer primaries and tail feathers rounded or bluntly pointed, feathers of alula sharply pointed. Voice. Extensive repertoire of at least eleven calls. Both sexes defend territory with loud, harsh "shek-shek-shek"; female often responds to male "shek-shek-shek" with staccato clicking and warbling "rattle". Series of "chiop" calls by male in aggressive territorial disputes. When agitated, gives "screech scolds" to mob predators; loud, raspy "distress screech" used for high-intensity mobbing. Female and young beg from mate and parents with "wah" note. Quiet "warble-song" may last 10 seconds, given by territorial males and females. Quiet "vrrt" for contact among adults, and "peep" by nestlings when gaping for food.
Habitat. Preferentially inhabits chaparral dominated by low-growing oak (*Quercus*), and oak woodland; found also in other woodland types, even relict pine (*Pinus*) forest, and shrublands, including sage (*Artemisia*) brushlands; driest areas of island (grasslands) and marine terraces utilized the least, and primarily by non-territorial floaters. Exploits greater diversity of habitats than *A. coerulescens*, but lesser diversity than *A. californica*.
Food and Feeding. Omnivorous. Diet includes acorns, invertebrates, and occasional small vertebrates; takes bird eggs and nestlings. Acorns a very important component of diet, especially in autumn. Caches acorns individually; also caches lizards and small mice (Muridae). Forages by gleaning as it hops on ground and through trees; searches under objects, and flycatches emerging insects. Appears to watch other breeding birds to learn where nests are, prior to preying on their contents. Singly and in pairs; non-breeders may form flocks.
Breeding. Laying from early Mar to early Jun, nestlings Apr to mid-Jun. Socially monogamous, pair-bond mostly permanent (c. 10% of bonds break annually, despite survival of both partners); no helpers at nest. Breeding pair defends all-purpose territory throughout year; territory size 0·6–2·2 ha (smaller than that of scrub-jays on California mainland), largest where least oak woodland present. Aggressive interactions subtle, consist mostly of territorial vocalizations by pair, rapid bobbing of head and torso, and undulating flight. Bulky nest built by both pair-members, of live oak twigs, lined with rootlets or horsehair, outer cup c. 30 cm in diameter and 15 cm tall, inner cup 10 cm in diameter and 7 cm deep, placed 2–3 m above ground in bush or tree. Clutch 2–5 eggs (mode 4); incubation by female, period 18 days; chicks fed by both parents, no information on duration of nestling period; young tended by both parents for 4–7 weeks after fledging. Age of first breeding ranges from 1 to 6 years, mostly 4 years, much later than for *A. californica*.
Movements. Resident. Occasionally moves up to 650 m to local food resources, e.g. fruiting oak trees. Non-breeders roam widely across island.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Global population conservatively estimated in 1997 at 12,500 individuals, with (7000 breeders), but currently at 9000 individuals (7000 breeders). Despite these numbers, species considered potentially at risk because of small range; restricted to Santa Cruz (250 km²), in California Channel Is. Degradation of native oak vegetation by invasive species, overgrazing by introduced sheep and pigs, and erosion threaten to reduce this species' population size. These threats now being managed and overgrazing controlled in order to maintain this and other unique native species.
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8. Florida Scrub-jay

Aphelocoma coerulescens

French: Geai à gorge blanche **German**: Floridahäher **Spanish**: Chara Floridana
Other common names: Florida Jay

Taxonomy. *Corvus coerulescens* Bosc, 1795, in Amer. septentrionale = Florida, USA.
May form a superspecies with *A. californica* and *A. insularis*, and the three previously treated as conspecific. Relationships of this group with *A. ultramarina* and *A. unicolor* yet to be resolved, as recent studies indicate that divergence of these three major lineages within the genus was apparently rapid, leading to conflict among genetic markers. Present species hybridizes with *A. californica* (in captivity), and recorded as hybridizing once with *Cyanocitta cristata*. Monotypic.
Distribution. Peninsular Florida, in SE USA.
Descriptive notes. 26 cm; male 79·3 g, female average 75 g. A moderate-sized, crestless, long-tailed jay with stout hook-tipped bill. Has dull purplish-blue head with frosty white forecrown blending into superciliary region, white throat finely streaked blue; upperparts pale grey-brown, rump, uppertail-coverts and tail dull blue, upperwing dull blue, primaries tipped dull, dark grey;



blue necklace separating whitish throat from grey breast and belly, flanks faintly streaked brownish, undertail-coverts blue; iris brown; bill and legs black. Differs from other scrub-jays mainly in having white forecrown merging into superciliary area (rather than clearly defined white supercilium), paler back. Sexes similar, female slightly smaller and paler blue than male. Juvenile differs from adult in having dull, dark brown head, duller wings and tail, and dull brown scapulars, median and marginal upperwing-coverts and uppertail-coverts, initially has brownish bill, yellow gape, and brownish-black legs; older juvenile best distinguished from adult by dull brown tips of greater primary coverts. Voice. Large vocabulary of graded calls. Loud "weep", often in series of variable length and cadence, for territory defence. Single "kweep!" may warn group-members of predator near dependent young; series of "kweep!" warns of aerial predators; grating, repeated "screech scold" against ground or perched predators. Aggressor gives short guttural "attack growl" just prior to physical contact with another jay; "snarl" given before predator attacked during nest defence; soft "chiop" may indicate anxiety during territorial defence. Relaxed adults and juveniles combine whistles, chirps and guttural notes into soft "warble-song". Low, raspy "kuk" before food or nest material exchanged. Young nestlings "peep"; older nestlings, dependent young and nesting females utter "waah" while begging. Female gives mechanical series of "hiccup" when agitated, perhaps analogous to rattle of congeners.
Habitat. Isolated patches of oak (*Quercus*) scrub on sandy ridges; avoids pine (*Pinus*) forest, but occurs in housing developments within oak scrub. Unique, fire-dependent habitat dominated by short (less than 3 m) evergreen oak shrubs (five *Quercus* species), rusty lyonia (*Lyonia ferruginea*) and Florida rosemary (*Ceratiola ericoides*), sparse ground cover including palmetto (*Serenoa repens* and *Sabal etonia*); bare sand important for foraging and caching. Good drainage results in habitat that is dry, despite being in areas with more rainfall than environments used by other *Aphelocoma* species.
Food and Feeding. Omnivorous. Variety of plant foods includes berries, acorns, pine seeds; arthropods, including grasshoppers and bush-crickets (Orthoptera), wasps and bees (Hymenoptera), ticks (Ixodoidea), lepidopteran larvae, spiders (Araneae); small vertebrates, e.g. snakes, lizards e.g. green anoles (*Anolis carolinensis*), tree-frogs, nestling birds, eggs including those of conspecifics, mice (Muridae); also takes carrion, and human subsidies (notably peanuts and other seeds at birdtables). Focused on acorn harvest and caching during Aug–Dec. Scatter-caches 6500–8000 acorns mostly within territory each autumn; recovery of stores especially important in late winter and early spring, when arthropods less available. Routinely inspects and moves acorn caches. Caches also animal parts and bird eggs (perhaps only short term), but above ground in vegetation. Searches for food in dry parts of territory, including shrubby oaks, grassy road margins, palmettos; hunts edges of seasonal ponds for reptiles and amphibians, especially during winter. Often listens for prey and creeps under and into vegetation, probing for insects and small vertebrates; will pursue prey by flycatching or attempt to flush prey by beating vegetation with wings and feet. May opportunistically hunt co-operatively for medium-sized snakes.
Breeding. Nest-building Feb to late Apr (most in Mar), and eggs late Mar to May, earlier in suburban settings; normally only one brood per year, but 30–40% of suburban pairs attempt second brood after fledging a first, although very few successful. Forms long-term monogamous pair-bond in permanent all-purpose territory; territory 4–20 ha (average 8–9 ha) in wildlands, suburban territories can be especially small (5 ha) where permanent sources of human-provided food utilized. Solitary or co-operative breeder, with up to six pre-breeding helpers (typically yearling males or females from previous breeding season), occurrence of helping varies annually (27–80% of pairs; average 52% of pairs in optimal habitat); on average, pair helped by a single yearling, which participates in territorial defence, predator-mobbing, sentinel activity, alarm-calling, and usually feeding of nestlings and fledglings; helpers increase reproductive success, thereby gaining indirect fitness benefits, also benefit from reduced mortality and increased ability to obtain nearby breeding space (including some males which inherit or "bud off" portions of their natal territory for exclusive use). Bulky nest of coarse oak twigs, platform 18–20 cm in diameter, with sparse inner layer of fibres (cup diameter 8–9 cm), placed c. 1 m above ground on main stem of scrub oak, generally well hidden in shady portion of shrub; in suburbs and in citrus groves often placed higher in taller shrub or low in tree. Clutch 1–4 eggs, average at Archbold Biological Station 3·3, clutch size significantly larger in suburban settings; incubation by female, period 16–21; female fed on and off nest by male; chicks brooded and shaded by female, fed by both pair-members and by any helpers present, nestling period 12–25 days (average 18 days); fledglings fed by all members of group until c. 85 days old; dispersal usually delayed 1–2 years, and only of short distance, especially for males, with 80% of males and 50% of females breeding within two territories (c. 0·8 km at Archbold Biological Station and Kennedy Space Center) of natal site. Breeding success increases with age and experience for several years; during 1969–1985, at Archbold Biological Station, 200 breeding jays had average lifetime productivity of 7·4 fledglings, 4·2 independent young, and 2·2 yearlings; pairs in suburban sites, having constant supply of supplemental food (e.g. birdseed, peanuts, bread), breed earlier and lay larger clutches than those in wildlands, but suffer greater nest loss to predators, frequent (30% of successful nests) brood reduction, and poor post-fledgling survival of early-hatched nestlings which have limited access to natural foods (especially arthropods); snakes are common nest predators. Maximum recorded lifespan 15·5 years; 8·4% of adults live for 10 or more years.
Movements. Resident. Maximum known dispersal distance 17 km for males and 38 km for females in contiguous habitat, and 35 km for males and 50 km for females in fragmented habitats.
Status and Conservation. VULNERABLE. Locally common; restricted to scrub and shrubby areas in Florida. Has small and fragmented population and range, which are rapidly declining. Global population estimated at 8000 individuals. Habitat being replaced by housing developments and citrus groves; in addition, suppression of natural fire regimes (burn frequencies of 3–15 years) causes overgrowth of scrub and increase in density of pines, rendering habitat unsuitable for this species. Continuing scrub loss and scrub degradation and fragmentation (especially by roads) have reduced quality of many territories, so that source-sink population dynamics becoming evident. Populations along C Atlantic coast of Florida declined by 4% per year during 1992–2002. If current rate of urban development continues, consequent loss of range will soon be sufficient for this species to be listed as Endangered. Large reserves will be important for maintaining this species in short term. These will need frequent fires so that each jay territory has at least 1 ha of scrub 120–170 cm tall, with bare sand patches for acorn-caching and foraging; landscapes surrounding reserves will need attention so that limiting factors in suburban sinks are reduced. The survival of this corvid will depend on maintaining many large population sources, enabling adaptation to future challenges of climate change and exotic disease.
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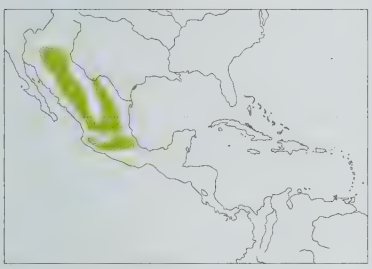
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9. Mexican Jay

Aphelocoma ultramarina

French: Geai du Mexique **German**: Graubrusthäher **Spanish**: Chara Mexicana
Other common names: Grey-breasted/Ultramarine Jay

Taxonomy. *Corvus ultramarinus* Bonaparte, 1825, Temascáltepec, Mexico.
Relationships of this species with the *A. coerulescens* group and *A. unicolor* yet to be resolved, as recent studies indicate that divergence of these three major lineages within the genus was apparently rapid, leading to conflict among genetic markers. Races traditionally arranged into three geographical groups, but recent genetic evaluation suggests that isolation among rugged mountains of the region has produced four independently evolving clades: "*wollweberi*" group (includes also *gracilis* and *arizonae*), "nominate group" (with *colimae*), "central group" (*potosina*) and "eastern group" (*couchii*). Race *wollweberi* intergrades gradually with *arizonae* to N and *gracilis* to S. Seven subspecies recognized.
Subspecies and Distribution.
A. u. arizonae (Ridgway, 1874) – S USA (SE Arizona and SW New Mexico) S to N Mexico (N Sonora and NW Chihuahua).
A. u. wollweberi Kaup, 1854 – SE Sonora and SW Chihuahua S in Sierra Madre Occidental to W Zacatecas and N Jalisco.
A. u. gracilis G. S. Miller, 1896 – W Mexico (Nayarit and NW Jalisco).
A. u. couchii (S. F. Baird, 1858) – extreme S USA (Chisos Mts of extreme SW Texas) S in Sierra Madre Oriental to S Nuevo León and N San Luis Potosí.
A. u. potosina Nelson, 1899 – EC Mexico (San Luis Potosí S to C Hidalgo).
A. u. colimae Nelson, 1899 – SW Mexico (most of Jalisco and NE Colima).
A. u. ultramarina (Bonaparte, 1825) – SC Mexico (SE Jalisco and NW Michoacán E in S plateau region to Veracruz).



Descriptive notes. 28–32 cm; male 84–150 g, female 77–137 g. Small, chunky, crestless jay, dull bluish above and dingy below, with fairly heavy, pointed bill; bill length varies significantly with season, shorter in winter. Nominate race has head dark bluish, lores black, upperparts more bluish-purple; brownish-grey below, throat and undertail-coverts paler; iris brown; bill and legs black. Sexes similar, male slightly larger than female. Juvenile differs from adult in being mostly mouse-grey above with hint of dull blue wash, tail grey to blue-green and duller, wings greyer and with distal portions dark brown, legs brown, gradually deepening to black, bill typically pale; first-year in autumn slightly smaller (especially in wing and tail) than adult, with duller plumage, juvenile tail retained until definitive moult complete (c. 12 months after hatching). Races differ mainly in depth of coloration of plumage and in size: *colimae* is smaller and lighter in colour than nominate, with less purplish hint; *potosina* is duller and smaller than nominate; *arizonae* is deep dull blue above, facial region dull but darker blue, back brownish-grey with dull blue, rump more blue than black, uppertail-coverts light dull blue, primaries with dull dark brown tips, chest light brownish-grey with some dull blue cast (obscure broad band from side of neck across upper chest), belly and undertail-coverts white; *wollweberi* is smaller than previous, bluer above, has lighter underparts, juvenile browner-backed; *gracilis* is lighter in colour and smaller than last, strikingly smaller than *arizonae* and with back darker and less blue, underparts lighter with little or no blue wash; *couchii* is smaller than *arizonae*, has darker back, darker and more intensely blue neck and head with stronger contrast between neck and back, lighter throat contrasting more with brown-grey breast, blue (rather than brownish-grey) wash on lower breast and belly, juvenile overall darker and browner with less grey. Voice. Not formally studied. Like other corvids, has soft "whisper-song", begging calls, and "rattle". Whisper-song given by male during courtship and by lone individuals; only female thought to "rattle"; young and subordinate birds, including breeding females, beg from parents, mates and dominant flock-members. "Loud call" by flock-members when encountering trespassing jays, stationary predators, and generally when scolding in agitated manner; softer version, "hawk buzz", given to accipiters and other flying raptors.
Habitat. Montane mixed woodland with oak (*Quercus*) and pine (*Pinus*) or juniper (*Juniperus*); at lower elevations found along creeks and grasslands with oak-dominated riparian woods. Reliant on the acorns or large seeds of piñon pine that occur throughout these habitat types.
Food and Feeding. Omnivorous; seasonal specialist on pine and oak crops. Diet nuts, fruits, seeds, nectar; invertebrates; small vertebrates, e.g. lizards, small birds and nest contents (including those of own species). Takes carrion and, where available, scraps provided by humans. Cached nuts eaten throughout winter and early spring, even by incubating female. Opens acorns and pine seeds by forceful pounding and tearing; bill morphology reflects diet at local scale (those eating pine seeds have long, unhooked bill, acorn-eaters have stouter, hooked bill). Lives in small, permanent flocks of 2–25 individuals. Stores food throughout year, especially Jul–Aug, when acorns and pine seeds harvested and cached singly throughout group's territory. Caches thousands of pine seeds and acorns per autumn, in hundreds of locations; in each trip from harvest to caching grounds, transports up to five seeds in mouth or bill a short distance (1–500 m); individual uses spatial memory to recover seeds cached by itself and those seen cached by others. Feeds primarily on ground for insects and stored nuts, and in shrubs and tree canopy and on trunks for fruits, seeds, nectar and invertebrates.
Breeding. Nest-building begins late Feb and early Mar and laying late Mar to early Apr (rarely through Jun) in S USA (Arizona); repeated nesting after failure. Variety of social bonds formed among males and females, which live together in group and communally defend all-purpose territory; territories exclusive property of group, and stable in size and location for decades; within flock, males compete for mates and females compete over nests. Extremely complex breeding system varies from monogamous (most situations) to polygynandrous (with multiple breeding males and breeding females in one social group), exclusive pair-bond rare; each female guarded by a male, which (if dominant over other males) sires most or all young in her nest, but multiple paternity of a clutch frequent, and ability to obtain extra-pair fertilizations favours subordinate males, which may remain in natal flock as helpers; rarely, two females lay in a single nest and share incubation. Male typically initiates nest construction and may select nest-site, female may also "approve" site, usually only single male and female build nest, but several nests initiated simultaneously by male–female pairs within group; in Arizona, bulky nest had coarse outer platform 33 cm in diameter and 7·6 cm deep, made with dead twigs, rootlets woven into coarse outer sticks, inner cup (12·7 × 5·1 cm) lined with fibres from shredded yucca (*Yucca*) leaves and animal hair (material often stolen from other pairs within territory during building process), placed 3·7–24·4 m above ground and well concealed in leafy tree; entire nests of subordinate pairs may be usurped by dominant pairs. Clutch 1–5 eggs (typically 4–5); incubation by female, fed throughout by the guarding male and most other group-members (excluding other breeding females), period 18 days; chicks brooded by incubating female, fed by all group-members, nestling period 24–28 days; juveniles continue to be fed for several weeks after fledging, and most spend entire life in natal flock, often breeding in company of parents and siblings. In Arizona success typically high, each female produced on average 1·4 fledglings per year (older breeders more successful than inexperienced ones), and lifetime reproductive success of females 8·7 fledglings (range 0–50); females may continue to experience improved pairing and egg-laying success at age of 8 and above; birds nesting early in year in Arizona produced more nestlings, yearlings and three-year-olds. Recorded longevity 21 years in the wild; in Arizona, annual survival rate of individuals at least 1 year old was 81%.
Movements. Resident. Dispersal extremely limited, but rare long-distance movements and wanderings of vagrants to unusually low or high elevations have been documented; one record in S Kansas (SC USA). Some wander from territory in harsh winters.
Status and Conservation. Not globally threatened. Common throughout range. In Arizona, average size of home range 0·36 km². Populations in Arizona fluctuated annually during 1986–1994, but no constant increase or decrease. In Mexico, race *potosina* (in C plateau) and nominate and *colimae* (in Transvolcanic Range) are at risk because they occur in small area undergoing extensive habitat clearance for agriculture and timber. Throughout its range, this species is vulnerable to exotic and increasingly common diseases, including West Nile Virus, which is deadly to most corvids, and Sudden Oak Death; also to loss of pinyon pine woodlands to drought and fungus, which can reduce oak and pine mast.
Bibliography. Barken *et al.* (1986), Bednekoff & Balda (1996a), Bednekoff *et al.* (1997), Bhagabati *et al.* (2004), Bridge *et al.* (2008), Brown, J.L. (1963a, 1970, 1972, 1974, 1983, 1997), Brown, J.L. & Brown (1980, 1981, 1985), Brown, J.L. & Horvath (1989), Brown, J.L. & Li Shouhsien (1995, 1996), Brown, J.L., Brown *et al.* (1997), Brown, J.L., Li Shouhsien & Bhagabati (1999), Craig *et al.* (1982), Cully & Ligon (1976), Curry *et al.* (2002), Edwards (1986), Eimes *et al.* (2004), Ericson *et al.* (2005), Espinosa de los Monteros & Cracraft (1997), Hardy (1961), Hubbard & McPherson (1997), Kamil *et al.* (1994), Li Shouhsien & Brown (2000), Ligon & Husar (1974), McCormack (2007), McCormack & Brown (2008), McCormack, Bowen & Smith (2008), McCormack, Peterson *et al.* (2008), McDonald *et al.* (1999), Olson *et al.* (1995), Peterson (1991b, 1991c, 1992a, 1992b), Peterson & Burt (1992), Peterson, Martínez-Meyer & González-Salazar (2004), Pitelka (1945b, 1951c), Rice *et al.* (2003), Saunders & Edwards (2000), Strahl & Brown (1987), Trail *et al.* (1981), Westcott (1969), Zusi (1987).

10. Unicoloured Jay

Aphelocoma unicolor

French: Geai unicolore **German**: Einfarbhäher **Spanish**: Chara Unicolor

Taxonomy. *Cyanocorax unicolor* du Bus de Gisignies, 1847, le Méxique = San Cristóbal de Las Casas, Chiapas, Mexico.
Relationships of this species with the *A. coerulescens* group and *A. ultramarina* yet to be resolved, as recent studies indicate that divergence of these three major lineages within the genus was apparently rapid, leading to conflict among genetic markers. Five subspecies recognized.
Subspecies and Distribution.
A. u. concolor (Cassin, 1848) – E Mexico (E Hidalgo, WC Veracruz, México, Puebla).
A. u. guerrerensis Nelson, 1903 – SW Mexico (near Omilteme, in Guerrero).
A. u. oaxacae Pitelka, 1946 – C highlands of Oaxaca, in S Mexico.
A. u. unicolor (du Bus de Gisignies, 1847) – S Mexico (around San Cristóbal and E along Sierra Madre to Pico de Loro, in Chiapas) and Guatemala (E in Sierra de las Minas to Chilasco).
A. u. griscomi van Rossem, 1928 – El Salvador and W Honduras (from Los Esesmiles and Mt Pucca E to Alto Contoral and Rancho Quemado).



Descriptive notes. 27–32 cm; male 119–153 g, female 113–136 g. A crestless, long-tailed, wholly blue jay of moderate size, with rather heavy hook-tipped bill. Nominate race is mostly uniformly dark blue, with black area around eye, duller back; chin streaked grey, undersurfaces of wing and tail brownish-black; iris brown; bill and legs black. Sexes similar, female smaller than male. Juvenile is faintly bluish-grey, with dull blue wings and tail, dull brownish-black underwing and undertail, and most of lower mandible yellow; immature bluer, entire bill gradually turns from pinkish yellow to black in first 1–2 years. Races differ in tone of plumage and in size: *concolor* is similar in size to nominate (but with smaller feet), plumage intermediate between bluer nominate and purpler *oaxacae*; *guerrerensis* is longer-tailed, darker and more purplish than other races; *oaxacae* is slightly smaller than others, more purplish and darker than nominate, most similar to previous but slightly less purplish; *griscomi* is similar to last, but slightly less purplish and larger (especially bill). Voice. Vocalizations known primarily from single population in Chiapas (nominate race). More than 40 sounds distinguishable; great variety of acoustic components, including wide-band noise, complex combinations of fundamentals and overtones, single pure tones (rare); many calls have overall upward inflection and/or downward terminal flourish. Can sound grating/harsh, musical/resonant, whistled; loud or soft.

Commonest loud long-range calls "weet", "wit", "ralph", "zhreenk", some less common ones as "heup", "cleemp" and "gronk"; commonest soft short-range calls "poit", "kuk" and "wah"; graded variations on all of these and many others. Two kinds of "rattle" call, one slow and one fast, both only by females. Rambling low-volume "whisper-song". Overall, vocabulary most similar to those of *A. ultramarina* and *A. californica*; less similar to that of *A. coerulescens*. Association of particular calls with particular contexts less well known than for *A. californica*. Loud sounds used for long-range contact; in defence of group territory boundary, in mobbing perched or ground predators and in warning of overhead predators; and during enigmatic "calling conventions" in which jays perch and call to other group-members at relatively short range in a way that appears not to serve any of aforementioned functions. Female sometimes calls loudly from nest, and while leaving or approaching it. Soft sounds used in flock movement, courtship, mate-guarding, nest-building; and by juveniles when begging.

Habitat. Locally distributed in wet, mist-covered, tall, luxuriant tropical cloudforest (2135–3050 m) on high mountains or lower (1370–2590 m) but similarly vegetated steep Caribbean slopes. Humid hardwood forests in Sierra Madre del Sur, humid mixed pine (*Pinus*)–deciduous forest, cypress and pine forests in Guatemala, and dense montane mixed forest of pine, evergreen oak (*Quercus*) and hardwoods in El Salvador. In Lagunas de Montebello National Park (Chiapas), inhabits wet forests of pine (*Pinus oocarpa*), oak (*Quercus sapotifolia*, *Q. elliptica*, *Q. candicans*, *Q. segovianensis*, *Q. peduncularis* and *Q. acutifolia*) and sweetgum (*Liquidambar styraciflua*), where trees festooned with *Usnea* lichens, bromeliads (*Tillandsia*), mosses and orchids and bracken (*Pteridium aquilinum*) common on forest floor; dense, dripping fog frequently occurs in morning.

Food and Feeding. Omnivorous. Eats berries of *Rubus* and other species, *Myrica* fruits, moths (Lepidoptera), katydids and crickets (Orthoptera), cicadas (Cicadidae), anole lizards (*Anolis*), nestling birds, and human discards (corn, tortillas, pastry); closely associated with oaks and pines, and known to eat seeds of both. Caches in trees and recovers stored food. Forages mostly in trees among lichens and bromeliads, rarely coming to ground. Found in small flocks of 5–8 individuals.

Breeding. Nest-building from as early at 19 Jan in S Mexico (Chiapas). In five-month study of four partially ringed flocks in Lagunas de Montebello National Park (Chiapas), stable groups of adult males and females included a female breeder, a primary male, and secondary (less dominant) males and females; secondary males occasionally copulate with primary female and may share paternity with primary male. All members of flock defended permanent home range of at least 12 ha (Jan–Jun); best-studied flock defended range of 41–45 ha. Unusual in that secondary birds join primary ones in nest-building; nest a bowl 40 cm in diameter and 15 cm deep, made from twigs (commonly oak twigs 2–5 mm in diameter and 35 mm long), lined with rootlets, lichens and a few pine needles, inner cup 11 cm in diameter and 3 cm thick, placed at height of 5·5–13·5 m in fork of crown or on major limb against trunk of pine, oak or madrona tree (*Arbutus menziesii*); nests begun in pine often not completed. Clutch at least 3–4 eggs; only primary female incubates, no information on duration of incubation period; chicks brooded by primary female breeder, nestling period 21–26 days; most group-members feed incubating female and nestlings; fledglings skilled fliers after 10 days out of nest, but continued to depend on parental care for at least 55 days after fledging.

Movements. Resident.

Status and Conservation. Not globally threatened. Relatively common in Guerrero, in S Mexico; nationally threatened in El Salvador. Fragmented and habitat-restricted distribution makes this species vulnerable to extirpation; may already have disappeared from Mexican states of Veracruz, México and Puebla.

Bibliography. Bridge *et al.* (2008), Curry *et al.* (2002), Ericson *et al.* (2005), Espinosa de los Monteros & Cracraft (1997), Goodwin (1986), Komar (1998), Madge & Burn (1994), McCormack *et al.* (2009), Peterson (1991b, 1992a, 1992b), Peterson & Burt (1992), Peterson, Martínez-Meyer & González-Salazar (2004), Pitelka (1945b, 1946, 1951c), Rice *et al.* (2003), Saunders & Edwards (2000), Van Rossem (1928), Webber (2009), Webber & Brown (1994), Zusi (1987).

Genus *CYANOLYCA* Cabanis, 1851

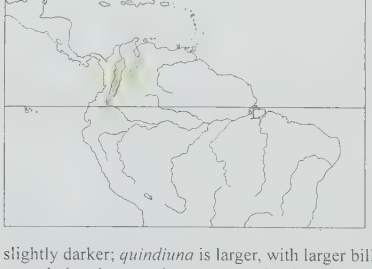
11. **Black-collared Jay**

Cyanolyca armillata

French: Geai à collier **German**: Halsbandhäher **Spanish**: Chara Collareja
Other common names: Collared Jay

Taxonomy. *Cyanocorax armillatus* G. R. Gray, 1846, no locality = Bogotá, Colombia.
Forms a monophyletic group with *C. viridicyanus* and *C. turcosa*; all three formerly considered conspecific, but differ in morphology and probably voice. Three subspecies recognized.

Subspecies and Distribution.
C. a. meridana (P. L. Sclater & Salvin, 1876) – NW Venezuela (Trujillo, Mérida and NW Táchira).
C. a. armillata (G. R. Gray, 1846) – E Andes of SW Venezuela and Colombia (Táchira S along R Chiquito).
C. a. quindiuna (P. L. Sclater & Salvin, 1876) – C Colombia (from Quindío Mts, in C Andes, S to E slope of Andes of Pasto) S to extreme N Ecuador (Carchi, N Napo).



Descriptive notes. 30–34 cm; 190–210 g. Nominate race has forehead, lores and sides of head black, forming a broad mask, crown and nape dull violaceous blue; throat and contiguous part of central upper breast ultramarine, bordered by narrow black line which connects to rear of black ear-coverts; remainder of plumage, including wing and tail, cyan-blue, inner margins of primaries dark brown, underwing and underside of tail blackish; iris brown; bill and legs black. Sexes similar. Juvenile is duller than adult, with greyer throat, body feathers greyish with blue only at tips. Race *meridana* is similar to nominate, but slightly darker; *quindiuna* is larger, with larger bill and longer tail than other races, has crown and nape darker than nominate, contrasting less with back, plumage tinged greenish overall, especially on back, belly, wing and tail. Voice. Large vocal repertoire consisting of variety of short and often musical notes, e.g. a rising, almost twanging "shrwee", various shrill rising and falling notes, a sharp, stuttered "jet-jtjtjtjt", a low guttural "wowr", and soft, liquid "craa".

Habitat. Humid, mossy cloudforest, at 1600–3250 m; frequent at forest edges.

Food and Feeding. Poorly documented. Forages in small flocks in subcanopy and canopy, along branches with epiphytes, hopping along and pausing to peer through foliage. Occasionally descends to gulleys with tree-ferns and bamboo thickets.

Breeding. No information. Seems to occur between Jun and Oct in Colombia.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Poorly known. Quite numerous in W Venezuela; considered uncommon, even rare, in Colombia, and exceptionally rare in Ecuador. Can be rare even in areas of suitable habitat.

Bibliography. Blake & Vaurie (1962), Bonaccorso (2009), Clements (2000), Dickinson (2003), Fjeldså & Krabbe (1990), Goodwin (1976), Hilty & Brown (1986), López-Lanús *et al.* (2000), Madge & Burn (1994), Meyer de Schauensee (1966, 1970), Remsen *et al.* (2009), Restall *et al.* (2006), Ridgely & Tudor (1989), Sibley & Monroe (1990), Stotz *et al.* (1996).

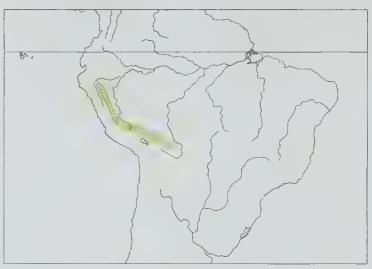
12. **White-collared Jay**

Cyanolyca viridicyanus

French: Geai indigo **German**: Blaukehlhäher **Spanish**: Chara Andina
Other common names: Collared Jay

Taxonomy. *Garrulus viridi-cyanus* d'Orbigny and Lafresnaye, 1838, La Paz, Bolivia.
Forms a monophyletic group with *C. armillata* and *C. turcosa*; all three formerly considered conspecific, but differ in morphology and probably voice. Three subspecies recognized.

Subspecies and Distribution.
C. v. jolyaea (Bonaparte, 1852) – N & C Peru (from Amazonas S to Junín).
C. v. cyanolaema Hellmayr, 1917 – SE Peru (Cuzco and Puno).
C. v. viridicyanus (d'Orbigny & Lafresnaye, 1838) – NW Bolivia (La Paz and Cochabamba).



Descriptive notes. 34 cm; 82–127 g. Nominate race has forehead, lores and side of head black, forecrown and side of crown white, white extending as very narrow stripe over and beyond eye; this white line continues around border of black facial area to connect with a narrow but conspicuous white band bordering lower edge of dark throat and upper breast; throat and adjacent central part of upper breast indigo, hardly contrasting with black facial region; rest of plumage cerulean blue, slightly bluer on crown and nape, underwing and underside of tail blackish; iris dark brown; bill and legs black. Sexes similar. Juvenile is presumed to be duller. Race *cyanolaema* is bluer than nominate, especially on crown and nape, with throat and upper breast ultramarine-blue, contrasting more clearly with black face; *jolyaea* is bluest race, slightly tinged with greenish on wings and tail, the white of crown restricted to forecrown and white collar even narrower than on nominate, throat and adjacent upper breast cobalt-blue, chin paler and clearly contrasting with black facial region. Voice. Large vocal repertoire, much of it atypical of jays, emitted in almost endless combination of components; in addition, 3–5 variations for each call. Some vocalizations resemble those of *Aphelocoma*, others those of *Cyanocorax* (has been suggested that, vocally, this species could be a bridge between those two genera). Typically, two upwardly inflected and nasal (rather harsh) notes, "schree" and "reek!", which resemble vocalizations of *Aphelocoma*. A rapid staccato chatter, which resembles calls of certain woodpeckers (such as genera *Colaptes* or *Dendrocopos*), but never more than two or three times in succession. Also, a soft and uninflected "croooh" (resembling that of *Cyanocorax*), slightly downward-inflected and harsh "craah" (like that of *Cyanocitta stelleri*), high-pitched "peep!" or "cheep!" (reminiscent of notes of domestic fowl hatchling). Sometimes "craah" combined with a mellow disyllablic whistle, "craahs-who-op".

Habitat. Montane forest, from humid luxuriant cloudforest to higher-lying more stunted elfin forest; chiefly between 1600 m and 3000 m, but to 4000 m in Peru. Recorded also at forest edges and older secondary growth, especially with bamboo and tree-ferns. One study site described as a subtropical forest of tall emergent trees (50 m) and closed canopy (30 m).

Food and Feeding. Poorly known. Flocks forage mostly along branches, investigating clumps of epiphytes and crevices at subcanopy and canopy levels.

Breeding. No information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Common locally, but rare or uncommon in most of its range.

Bibliography. Blake & Vaurie (1962), Bonaccorso (2009), Clements (2000), Clements & Shany (2001), David & Gosselin (2002a), Dickinson (2003), Fjeldså & Krabbe (1990), Goodwin (1976), Hardy (1967, 1984), Hennessey & Gomez (2003), Hilty & Brown (1986), Hornbuckle (1999), Liu Yang & Lei Jinyu (2005), MacLeod *et al.* (2005), Madge & Burn (1994), Meyer de Schauensee (1966, 1970), Meyer de Schauensee & Phelps (1978), Remsen *et al.* (2009), Ridgely & Tudor (1989), Salaman *et al.* (1999), Sibley & Monroe (1990), Stotz *et al.* (1996), Zimmer (1953).

13. **Turquoise Jay**

Cyanolyca turcosa

French: Geai turquoise **German**: Türkishäher **Spanish**: Chara Turquesa

Taxonomy. *Cyanocitta turcosa* Bonaparte, 1853, near Puerres, Nariño, Colombia.
Forms a monophyletic group with *C. armillata* and *C. viridicyanus*; all three formerly considered conspecific, but differ in morphology and probably voice. Monotypic.

Distribution. SW Colombia (Nariño) S in Andes (on both slope in C Ecuador) to N Peru (N Piura and NW Cajamarca).

Descriptive notes. 30–34 cm. Forehead, lores and side of head are black, crown and nape pale turquoise-blue, becoming paler on forecrown, throat very pale, almost turquoise-blue, darkening to purplish-blue towards lower throat; narrow black collar at upper breast; remainder of plumage cerulean blue, underwing and underside of tail blackish; iris probably brown; bill and legs black. Sexes similar. Juvenile is apparently duller. Voice. Most frequently heard are a loud "tsrrrp" and a liquid explosive "kworrr", both of which may be repeated three or four times; other short vocalizations, including clicked snapping sound.

Habitat. Montane humid cloudforest at 1500–3500 m; reaches forest edges into elfin woodland at tree-line. Seems more tolerant of open and secondary forest than *C. armillata*, possibly because



there are extensive stands of alders (*Alnus*), which it favours. One occupied site in NW Ecuador (Otonga), at 1700–2200 m, has been described as a cloudforest with a high diversity and abundance of epiphytic plants, especially bromeliads (Bromeliaceae), aroids (Araceae) and mosses.

Food and Feeding. Poorly documented. Said to forage in small flocks in subcanopy and canopy of forest interior, edges and second growth. Recorded in mixed flocks in a primary cloudforest in Loja Province (Ecuador), although had been considered an irregular member of such flocks.

Breeding. No information.

Movements. Sedentary.

Status and Conservation. Not globally threated. Fairly common in Ecuador, but seemingly not common in Colombia. Fairly common in Peru.

Bibliography. Becker *et al.* (2008), Blake & Vaurie (1962), Bonaccorso (2009), Clements (2000), Clements & Shany (2001), Dickinson (2003), Freile & Chaves (2004), Goodwin (1976), Hardy (1984), Hilty & Brown (1986), Madge & Burn (1994), Meyer de Schauensee (1966, 1970), Poulsen (1996), Remsen *et al.* (2009), Restall *et al.* (2006), Ridgely & Tudor (1989), Sibley & Monroe (1990), Stotz *et al.* (1996), Vellinga *et al.* (2004), Welford (2000), Zimmer (1953).

14. **Beautiful Jay**

Cyanolyca pulchra

French: Geai superbe **German**: Schmuckhäher **Spanish**: Chara Hermosa

Taxonomy. *Cyanocitta pulchra* Lawrence 1875, Quito, Ecuador.

This species and *C. cucullata* are sister-species. Monotypic.

Distribution. Pacific slope of Andes from C Colombia (extreme S of Chocó and Valle) S to NW Ecuador (S to S Pichincha). Monotypic.



Descriptive notes. 27 cm. Feathers of forehead and lores are short, dense and tufted. Male has forehead, lores and side of head black, crown and nape light sky-blue, whitish along upper border of black ear-coverts; upper mantle dull violaceous blue, rest of upperparts, including uppertail-coverts, sepia, upperwing and tail lighter cyan-blue; chin black, throat cyan-blue, becoming darker, almost sepia, on upper breast, and than cyan-blue towards belly; underside of wing and tail blakish; iris brown; bill and legs black. Female is similar to male, but usually with brownish tones on upperparts. Juvenile is drabber and browner than adult; first-year retains brown feathering on mantle and upperwing-coverts, and possible that only older males lose brown more or less completely. Voice. Quickly repeated mellow "chew-chew-chew" (grating call), loosely repeated, or given more continuously when excited; repeated short dry "graasp" and double "click" followed by rising whistle; single "click" and whistle, commonly repeated up to four times.

Habitat. Montane forest at 900–2300 m, mostly 1400–1800 m. Lives in mature humid subtropical forest and cloudforest; recorded infrequently at clearings, secondary growth and edges. Said to favour watercourses and marshy areas.

Food and Feeding. Poorly documented. Forages in understory, more so than do congeners. Forages singly and in pairs; hops, peers, and flies short distances. Generally remains inconspicuous unless calling.

Breeding. No information.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Chocó EBA. Uncommon and local in Colombia; rare to locally uncommon in Ecuador. In Colombia, population at Río Ñambí Natural Reserve estimated at just 2–3 pairs in 5 km², but in Tambito Nature Reserve (in SW Colombia) this species is considered fairly common at 1400–1700 m. Generally very sensitive to human disturbance and appears almost exclusively dependent on primary forest. Logging is principal cause of its apparent population decline. Occurs in Cerro Golondrinas Reserve, in Ecuador (Carchi).

Bibliography. Anon. (2008p), Becker *et al.* (2008), Blake & Vaurie (1962), Bonaccorso (2009), Butchart & Stattersfield (2004), Clements (2000), Dickinson (2003), Donegan & Dávalos (1999), Goodwin (1976), Hardy (1984), Hellmayr (1934), Hilty & Brown (1986), Madge & Burn (1994), Meyer de Schauensee (1966, 1970), Orejuela (1987), Pearman (1993), Pitelka (1951a), Remsen *et al.* (2009), Restall *et al.* (2006), Ridgely & Tudor (1989), Sibley & Monroe (1990), Stattersfield & Capper (2000), Stotz *et al.* (1996), Welford (2000).

15. **Azure-hooded Jay**

Cyanolyca cucullata

French: Geai couronné **German**: Blaukappenhäher **Spanish**: Chara Coroniazul
Other common names: Hooded Jay

Taxonomy. *Cyanocorax cucullatus* Ridgway, 1885, Navarro, Costa Rica.

This species and *C. pulcra* are sister-species. Four subspecies recognized.

Subspecies and Distribution.

C. c. mitrata Ridgway, 1899 – E Mexico (extreme SE San Luis Potosí and Veracruz) S to CE Oaxaca).

C. c. guatemalae Pitelka, 1951 – S Mexico (Chiapas) and N Guatemala (Huehuetenango, Alta Vera Paz).

C. c. hondurensis Pitelka, 1951 – W Honduras (Caribbean slopes).

C. c. cucullata (Ridgway, 1885) – Caribbean slope of Costa Rica and Panama, extending locally across to Pacific slope.

Descriptive notes. 26–31 cm; 88–109 g. Feathers of forehead and loral region are short, upstanding, and plush-like. Nominate race has forehead and side of head black, crown and nape sky-blue,



this colour extending slightly in an arc around rear ear-coverts; some individuals have a whitish area above forehead; throat, breast and mantle sepia; rest of plumage, including upperwing and tail, cyan-blue, underwing and undertail blackish; iris dark red; bill and legs black. Sexes similar. Juvenile is duller than adult, has underparts entirely light sepia, iris presumably dull brown, no white on forecrown. Race *mitrata* is larger than nominate, has black of forehead extending farther back onto crown, a narrow white border at front and side of crown, this continuing around lower rear of ear-coverts; *hondurensis* has broader area of white on forecrown and side of crown (in extent intermediate between nominate and previous), and underparts duller, less purplish-blue; *guatemalae* has occipital area and upperparts more cyan-blue. Voice. Most frequent vocalization a clear and loud whistle, "djeek", upwardly inflected, given in rapid series of 3–4 while flock foraging. Also gives single upward-inflected nasal "woyt", which may be alarm call, and a dry, scolding and raucous "raaah"; also a loud snapping, which possibly a non-vocal sound.

Habitat. Interior of cloudforest at 800–2100 m, where vegetation includes tree-ferns of several species, sweet gum (*Liquidambar*), yellow poplar (*Liriodendron*), basswood (*Tilia*) and *Podocarpus*; also in forest borders and oak woodland. Also ranges into tropical forests (often continuous with cloudforests) in foothills and lowlands.

Food and Feeding. Diet includes invertebrates, berries, and small fruits (*Miconia* and Ericaceae). Forages in pairs and in flocks of 3–10 individuals at lower and middle levels of forest, especially in dense vegetation, but found also in canopy. Probes clumps of moss and epiphytes; peers into and gleans invertebrates from foliage and crevices of tree trunks. Recorded as following swarms of ants (Formicidae); three records in total of 17 separate raiding army-ant swarms noted in subtropical forest in Costa Rica (Cordillera de Tilarán at Monteverde). Watched while foraging in trees where flock of *C. pumilo* feeding, but not seen to mix with flock.

Breeding. Season Apr–Jun in Costa Rica. Solitary nester. Nest a platform of twigs with inner cup (5 cm) of smaller twigs, lined roughly with plant fibres, placed 5–7 m above ground in small tree at forest edge. Two nests each held two young. No further information available.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Fairly common to common in much of range; can appear to be uncommon because of its inconspicuous behaviour. No indication of any threat.

Bibliography. Blake (1953), Blake & Vaurie (1962), Bonaccorso (2009), Clements (2000), Dickinson (2003), Goodwin (1976), Hardy (1964, 1984), Hellmayr (1934), Howell & Webb (1995), Madge & Burn (1994), Peterson *et al.* (2003), Pitelka (1951a), Remsen *et al.* (2009), Rojas Soto & Navarro Sigüenza (1999), Sibley & Monroe (1990), Stiles & Skutch (1989), Stotz *et al.* (1996), Vallely (2001), Van Perlo (2006).

16. **Black-throated Jay**

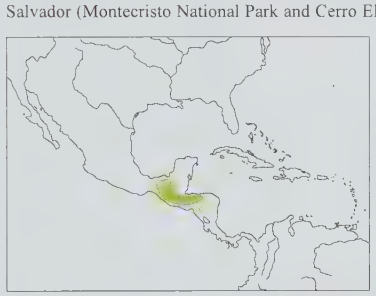
Cyanolyca pumilo

French: Geai à gorge noire **German**: Schwarzkehlhäher **Spanish**: Chara Gorjinegra
Other common names: Black-throated Dwarf Jay, Strickland's Jay

Taxonomy. *Cyanocorax pumilo* Strickland, 1849, Guatemala (probably Antigua, in Department Sacatepéquez).

This species and *C. nanus*, *C. argentigula* and *C. mirabilis* form a monophyletic group. Monotypic.

Distribution. Mountains of extreme SE Mexico (SE Chiapas), Guatemala, W & C Honduras, N El Salvador (Montecristo National Park and Cerro El Pital) and NW Nicaragua.



Descriptive notes. 25–28 cm; one bird 47 g. Feathers of forehead and lores short, dense and tufted. Forehead and sides of head black, throat sepia; narrow but conspicuous whitish line extends across forehead and over and behind eye, usually so as to create pale border along upper half of black facial area; reminder of plumage tends to cyan-blue, brighter on crown, nape and upperwing, and some individuals have underparts slightly tinged greenish; underwing and underside of tail dark grey; iris brownish; bill and legs black. Sexes similar, female duller than male. Juvenile is duller than adult, with black area of head more greyish-black and shading to blue-grey on throat, lacks whitish border of crown. Voice. Vocalizations resemble some of those of W populations of *Aphelocoma coerulescens*, such as sequence of rapidly repeated "kwesh" notes and a nasal "reek!", latter an alarm call. Other vocalizations, less frequently recorded in the field, are a soft chuckled "cheecheecheecheeche", a repeated squeaky "kirwik-kirwik-kirwik-kirwik", a soft queroulous "shrreee", and a short whining note interspersed with sharper calls.

Habitat. Lives in cloudforest between 1200 m and 3050 m, with tree-ferns of several species, sweet gum (*Liquidambar*), yellow poplar (*Liriodendron*), basswood (*Tilia*) and *Podocarpus*. Seen especially in forest ravines, and several times found in low growth at roadside; field observations indicate, however, that this species only rarely occupies open forests of mixed oaks (*Quercus*), alders (*Alnus*) and pines (*Pinus*). In Mexico considered a "core bird species" in upper cloudforest (above c. 1650–1700 m) in El Triunfo Biosphere Reserve (Chiapas), where *Quercus oocarpa*, *Matudaea trinervia* (Hamamelidaceae), *Hedyosmum mexicanum* (Chloranthaceae) and *Dendropanax populifolius* (Araliaceae) dominate; in Montecristo National Park (El Slavador), 360 km SE of El Triunfo, considered rare in cloudforest.

Food and Feeding. Invertebrates, including insects in both larval and adult stages and spiders (Araneae), and seen to eat large hairy caterpillars; one record of feeding on mulberry (*Morus*) fruits. Flocks of 5–12 individuals forage at all levels of forest, but no observations of feeding on ground. Prefers to forage in dense vegetation in bushes, hanging vines, canopy of tall shrubbery and trees, and dense shrubbery of forested ravines. Probes and pokes among clumps of leaves and lichens along branches and trunks; flock of eight individuals watched as it fed in upper branches of sycamore (*Platanus*) in cutover forest near a road. Sometimes forages with *C. cucullata* in same tree, but flocks not seen to mix.

Breeding. Virtually unknown. Immature seen in Jul and Aug in Mexico (El Triunfo Biosphere Reserve). Nest of twigs, placed in outer branches of tree canopy.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Not uncommon over its restricted range; was considered in danger of being extirpated in El Salvador. Detailed information on populations lacking.
Bibliography. Blake & Vaurie (1962), Bonaccorso (2009), Clements (2000), Dickinson (2003), Goodwin (1976), Hardy (1964, 1984), Howell & Webb (1995), Komar (1998, 2002), Madge & Burn (1994), Remsen *et al.* (2009), Sibley & Monroe (1990), de Silva Garza *et al.* (1999), Stotz *et al.* (1996), Van Perlo (2006).

17. **Dwarf Jay**

Cyanolyca nanus

French: Geai nain **German**: Zwerghäher **Spanish**: Chara Enana

Taxonomy. *Cyanocorax nanus* du Bus de Gisignies, 1847, Mexico.
This species and *C. pumilo*, *C. argentigula* and *C. mirabilis* form a monophyletic group. Monotypic.
Distribution. Mountains in Veracruz and adjacent Puebla and Oaxaca (sierras of Juárez, Aloapaneca and Zempoaltepec), in E Mexico.



Descriptive notes. 20–23 cm; 40–42 g. Forehead is lavender-coloured, crown and rest of upperparts, including upperwing and tail, cyan-blue, lores, malar region and ear-coverts black; very narrow lavender supercilium above black mask and curving down behind rear of ear-coverts; throat lavender, bordered below by very narrow, somewhat diffuse sepia stripe, underparts duller cyan-blue, underwing and underside of tail dull greyish; iris dark red-brown; bill and legs black. Sexes similar, female slightly duller than male. Juvenile is duller than adult, with forehead and supercilium dull greenish-blue and not noticeably paler than crown and with dull greyish-blue throat. Voice. Small vocal repertoire. Most common vocalization a nasal and harsh, but high-pitched double inflected "shreéup", delivered singly or in multiples of two or three, rapidly (almost run together), by undisturbed members of loose foraging flock when [illegible] and out of sight of each other; several variations of this call in different situations; soft version serves as contact/conversational note between two adults close to [illegible]; mid multiple versions heard from moving flock during foraging or when excited [illegible] ator (or human). Other raucous and harsh notes, such as begging call by female [illegible] incitation of food, and intense harsh rasp when humans close to nest.
[illegible] ixed pine–oak–fir (*Pinus–Quercus–Abies*) forests between 1400 m and 3200 m. [illegible] in Oaxaca (Cerro San Felipe), habitat ranged from nearly pure stands of oak, scattered pines and an understorey of subdominant broadleaf trees, to forests of [illegible] ne and oak representation, scattered fir (*Abies religiosa*) and abundant epiphytes; [illegible] eae) and abundant epiphytic growth are characteristic of these associations. Frequent [illegible] d growth, so long as the climax species of trees predominate (if tree cover 70% or [illegible] tracts of mature climax forest are nearby.
Feeding. Arthropods; no records of vegetable items in diet. Foraging individuals inves- [illegible] and around epiphytes, including clumps of bromeliads, ferns and lichens, in branches, and [illegible] ge in very dynamic way, hanging upside-down and hovering in manner of a tit (Paridae); [illegible] onally takes medium-sized flying insects. Also pokes and probes cracks and crevices and [illegible] r loose bark in more typical jay-like manner. Forages at middle level of interior of forest, [illegible] ow canopy; rarely, on the ground or in understorey; seems to visit canopy only when foraging [illegible] across relatively open areas of forest lacking lower vegetation levels. Normally in pairs, but in small flocks of up to twelve individuals after breeding season; flocks can be associated with other bird species, such as Grey-barred Wren (*Campylorhynchus megalopterus*); one recorded in association with *Aphelocoma unicolor*.
Breeding. Laying from late Mar to late Apr, and completely independent young in loose flocks in early Jul. Solitary nester, breeding as simple pair. Nest built by both sexes, usually during morning hours, a bulky compact mass of mosses and lichens, a few twigs (20–30 pieces, 5–15 cm long and 2–5 mm in diameter) incorporated, largely around top (strengthening the rim and cup), cup lined with fine rootlets, pine needles and/or strands of grass; large in relation to size of the jay, external diameter 16–19 cm, height 14–20 cm, internal diameter 7–8 cm and depth 7–7·5 cm; placed 3–15 m above ground near end of branch or in crown of oak. Clutch 2–3 eggs; incubation by female alone, fed at or near nest by male, period 20 days; at one studied nest, chicks brooded by female but fed by both parents, no information on duration of nestling period.
Movements. Sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in Southern Sierra Madre Oriental EBA. Fairly common to uncommon and local; recent records from extreme E Querétaro (Tangojó), N Hidalgo, C Veracruz and N Oaxaca (La Chinantla). Has small global population, which is declining rapidly in response to habitat loss. Forest fragmentation and degradation caused by logging, agricultural expansion, firewood-gathering, road and tourist developments, sheep-ranching, intense grazing and intensive urbanization have led to local declines or extinction. Was feared extinct throughout range except for Cerro San Felipe (N Sierra Aloapaneca), where it remains quite common; this site is within the Benito Juárez National Park, but borders of this have never been demarcated and it offers the species little protection. In C & S of range is found only above 1670 m, probably because of habitat alteration. It has recently been suggested that this jay's status should be upgraded to Endangered owing to threats facing the cloudforests in mountains of E & SE Mexico; although it can live in secondary-growth forest if tree cover 70% or more, this habitat type is also under severe pressure.
Bibliography. Anon. (2008p), Blake & Vaurie (1962), Bonaccorso (2009), Butchart & Stattersfield (2004), Clements (2000), Dickinson (2003), Escalante & Néquiz (2004), García-Trejo & Navarro Sigüenza (2004), Goodwin (1976), Hardy (1964, 1971, 1984), Howell & Webb (1995), Madge & Burn (1994), Martínez-Morales (2004), Remsen *et al.* (2009), Sibley & Monroe (1990), Stattersfield & Capper (2000), Stotz *et al.* (1996), Van Perlo (2006).

18. **Silvery-throated Jay**

Cyanolyca argentigula

French: Geai à gorge argentée **German**: Silberhäher **Spanish**: Chara Gorjiplateada
Other common names: Central American Jay

Taxonomy. *Cyanocitta argentigula* Lawrence, 1875, near Pico Blanco, above Sipurio, Costa Rica.
Forms a monophyletic group with *C. pumilo*, *C. nanus* and *C. mirabilis*. Two subspecies recognized.

Subspecies and Distribution.
C. a. albior Pitelka, 1951 – C Costa Rica (Cordillera Central).
C. a. argentigula (Lawrence, 1875) – S Costa Rica (Cordillera de Talamanca) and W Panama (E to Pico Blanco).



Descriptive notes. 25–27 cm; 65 g. Forehead and lores have an inconspicuous tuft of very short stiff feathers. Nominate race has head and neck, including malar region, black, narrow but conspicuous strongly violet-washed whitish band over forecrown and extending back almost as a supercilium; nape and upperparts black, uppertail-coverts slightly tinged cyan, upperwing and tail bright cyan-blue; throat lavender-coloured (tinged with violet in fresh plumage), underparts blackish, belly slightly tinged cyan, underwing and underside of tail blackish; iris dark red; bill and legs black. Sexes similar. Juvenile is duller than adult, with dull greyish-black on head, crown dusky blue, lacks whitish on forecrown and in supercilium, iris presumably duller. Race *albior* has forecrown band and supercilium white and throat pale grey (both areas tinged with violet in fresh plumage). Voice. Most frequent call a harsh, nasal, somewhat scratchy "jew-jeah-jeah" or a single "nyaaaah"; scolding call a harsher "zhraaak"; 2–4 sharper calls, "nyat-nyat-nyat", on taking flight; young give higher and faster "nyaah-nyaah". Said to be quite noisy when going to roost.
Habitat. Montane humid cloudforest, favouring oak (*Quercus*) forest, at 2000–3200 m; occasionally, perhaps seasonally, recorded also down to 1300 m.
Food and Feeding. Invertebrates, small frogs, small lizards, salamanders; also berries and small fruits. Forages in flocks of 4–10 individuals, but after breeding also in larger gatherings of up to 30 individuals. Flock moves through canopy and subcanopy, coming lower at edges and nearby second growth; investigates each tree methodically, inspecting foliage, bromeliads, and tufts of mosses and lichens, before moving on.
Breeding. No information available. Breeding said to occur between Mar and Jun.
Movements. Resident. Possible seasonal descent to lower elevations.
Status and Conservation. Not globally threatened. Restricted-range species: present in Costa Rica and Panama Highlands EBA. Generally rather uncommon. Low-density populations in Costa Rica; appears to be very uncommon in Panama.
Bibliography. Blake & Vaurie (1962), Bonaccorso (2009), Clements (2000), Dickinson (2003), Goodwin (1976), Hardy (1984), Madge & Burn (1994), Pitelka (1951b), Remsen *et al.* (2009), Sibley & Monroe (1990), Stiles & Skutch (1989), Stotz *et al.* (1996), Van Perlo (2006).

19. **White-throated Jay**

Cyanolyca mirabilis

French: Geai masqué **German**: Weißkehlhäher **Spanish**: Chara de Omiltemi
Other common names: Omiltemi/Omilteme Jay

Taxonomy. *Cyanolyca mirabilis* Nelson, 1903, Omilteme, Guerrero, Mexico.
This species and *C. pumilo*, *C. nanus* and *C. argentigula* form a monophyletic group. Monotypic.
Distribution. Guerrero (Sierra Madre del Sur) and Oaxaca (Sierra de Miahuatlan and Sierra de Yucuyacua), in SW Mexico.



Descriptive notes. 23–25 cm; 49·9–54 g. Forehead and lores with inconspicuous tuft of very short stiff feathers. Head and neck black, with white stripe running across forehead, extending back over eye as thin line and continuing around rear ear-coverts to neck side, where it meets white of chin and throat; nape and upper breast black; remainder of plumage duller cerulean blue, underwing and underside of tail dark grey; iris probably brown; bill and legs black. Sexes similar. Juvenile has face duller, with less distinct white borders, whitish throat ill-defined, upperparts dull bluish, underparts sooty greyish. Voice. Vocalizations uttered typically in twos and quickly repeated; resemble calls of *C. nanus*, but less high-pitched, less nasal and somewhat sweeter. Social alarm call a nasal "reek!", very similar to that of *Aphelocoma californica*. Contact call, when in loose foraging flock, a double inflected nasal note; sometimes this call is less nasal, then resembling that of *A. californica*. In mild alarm, a very nasal "chi-eery, cherrup", intensely querulous.
Habitat. Dense humid forest and mixed oak (*Quercus*) and pine (*Pinus*) woodland from 1525 m up to 3500 m; recorded also in disturbed areas. Oak trees may be essential for this species, at least at some period of the year.
Food and Feeding. No information available on diet. Rarely observed in the field; two observations were of pairs, a third was of a group of three or four individuals; one record in mixed flock that included five or six Emerald Toucanets (*Aulacorhynchus prasinus*) as well as 10–15 *Aphelocoma unicolor*.
Breeding. Breeding recorded Apr–Aug. No further information.
Movements. Resident. Suggestion of some local and seasonal movement.
Status and Conservation. VULNERABLE. Restricted-range species: present in Sierra Madre del Sur EBA. Locally fairly common. Has very small range and rapidly declining population as a result of forest fragmentation and degradation; these caused by clearance for timber, agricultural expansion (corn, fruit, coffee), and logging of pine–oak forests. Very little suitable habitat remaining below 1800 m. Although this species occurs in one protected area, the Omiltemi State Ecological Park (in Sierra de Atoyac), most of the area in which it occurs is not protected. It was recently suggested that present species should be considered Endangered, owing to accelerated loss of habitat in past two decades.
Bibliography. Anon. (2008p), Blake & Vaurie (1962), Bonaccorso (2009), Butchart & Stattersfield (2004), Clements (2000), Dickinson (2003), Escalante & Néquiz (2004), García-Trejo & Navarro Sigüenza (2004), Goodwin (1976), Hardy (1964, 1984), Howell & Webb (1994, 1995), Madge & Burn (1994), Navarro Sigüenza (1992), Peterson & Navarro Sigüenza (2000), Remsen *et al.* (2009), Sibley & Monroe (1990), Stattersfield & Capper (2000), Stotz *et al.* (1996), Van Perlo (2006).

PLATE 31 ➤


ssp chavezi
21
ssp melanocyaneus
20
23
22
24
25
PLATE 31
inches 4
cm 10
ultramarine
26
cerulean
27
28
30
31
32
29
ssp galeatus
35
ssp chrysops
ssp diesingii
33
34
ssp glaucescens
ssp yncas

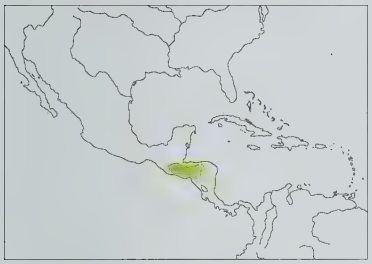
Genus *CYANOCORAX* Boie, 1826

20. Bushy-crested Jay

Cyanocorax melanocyaneus

French: Geai houppé **German**: Hartlaubblaurabe **Spanish**: Chara Centroamericana
Other common names: Hartlaub's Jay

Taxonomy. *Garrulus* (*Cyanocorax*) *melanocyaneus* Hartlaub, 1844, Guatemala.
This species and *C. sanblasianus*, *C. yucatanicus* and *C. beecheii* were formerly placed together in a separate genus, *Cissilopha* (the black-and-blue jays of Middle America). Races intergrade in N & E El Salvador and Honduras. Two subspecies recognized.
Subspecies and Distribution.
C. m. melanocyaneus (Hartlaub, 1844) – mountains of Guatemala and S El Salvador (coast range E to Volcán de Vicente).
C. m. chavezi (W. deW. Miller & Griscom, 1925) – mountains of Honduras and NW Nicaragua.



Descriptive notes. 28–33 cm; 80–115 g. Looks bulky-headed when crown feathers erected; feathers of forecrown somewhat stubble-like, but hardly crested. Nominate race has black hood extending down to upper mantle and breast; rest of upperparts, including wing and tail, cerulean blue; underparts below breast variable, from indigo to duller cerulean; underwing and underside of tail greyish; iris bright yellow; bill black; legs blackish. Sexes similar. Juvenile is fuscous brown, with wings and tail cerulean blue, but remiges only a little less bright than those of adult, iris dark brown, bill yellowish-horn (developing brownish tip just before fledging), legs dark grey, quickly (in first few weeks) acquires blackish head and body feathering and bill darkens from tip; first-year has black legs, bicoloured bill and dark brown iris, bill becomes black at c. 10 months; second-year almost like adult, but some whitish areas inside bill (all black in adult). Race *chavezi* is ultramarine-blue on back and tail, but has wings cerulean, underparts dark cyan-blue or, on some, almost blackish. Voice. Cawing call (social call), usually the most often heard vocalization, is short and inflected, and given in several contexts; female on nest emits variation of this call, a soft begging and lower-pitched "caw"; juvenile also has short "caw", which combines elements of begging and location. Contact call "chank chank". Subsong (*sotto voce*), common in this species, is associated with courtship but is also given by isolated birds.
Habitat. Edges of humid woodlands, especially of mixed pine (*Pinus*) and oak (*Quercus*), usually between 1000 m and 2450 m, sometimes lower into foothills; also in clearings and scrubby shrubbery, including coffee plantations. In Montecristo National Park (El Salvador), most frequent in pine–oak forest. In contrast, in a study site in Nicaragua (at 1200 m) seemed to be more abundant in disturbed areas than in undisturbed cloudforest; in one study, 20–50% of home range of one group consisted of coffee plantations, the rest citrus groves, roadside clearings and ecotonal areas.
Food and Feeding. Insects, including beetles (Coleoptera) and grasshoppers (Orthoptera), other invertebrates; also seeds, and fruits e.g. small figs (*Ficus*). Forages in flocks from low levels up to middle canopy, among trees and bushes; also on the ground, where it searches through leaf litter. Observations of a group actively attending swarms of army ants (Formicidae).
Breeding. Eggs recorded late Apr to mid-May, and in El Salvador recently fledged juveniles in mid-Jun; season apparently of two overlapping nesting periods, with either one or two nesting attempts in each. Communal breeder, in group with helpers; only one female lays, and one flock may attend one or two nests simultaneously. Courtship includes display in which pupils are constricted. Nest, built mostly by female, a simple accumulation of sticks lined with finer twigs, very sparsely constructed (may virtually disintegrate by the time when chicks leave), one had external diameter 17–20 cm, height 10 cm, internal diameter 10 cm, depth 5 cm; at one study site in Nicaragua, the nest placed 1·5–6 m above ground and always in coffee tree. Clutch usually 3–4 eggs, but one family group had five recently fledged juveniles; two females share incubation duties and the brooding of chicks, and up to eleven individuals recorded as helping to feed young; no information on duration of incubation and nestling periods.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in North Central American Highlands EBA. Not uncommon. In Montecristo National Park, in El Salvador, estimated density in pine–oak forest (at 1000–1900 m) 0·78 pairs/ha, significantly higher than the 0·26 pairs/ha in a 300-ha Mexican cypress (*Cupressus lusitanica*) plantation (1750–2000 m). Home range 4–5 ha. Lives at forest edges, which has enabled it to become established in areas cleared for agriculture, especially coffee plantations.
Bibliography. Blake & Vaurie (1962), Clements (2000), Dickinson (2003), Goodwin (1976), Hardy (1961, 1969a, 1973, 1974a, 1974b, 1979, 1984), Howell & Webb (1995), Komar (2002), Madge & Burn (1994), Remsen *et al.* (2009), Sibley & Monroe (1990), Skutch (1987), Stotz *et al.* (1996), Van Perlo (2006).

21. San Blas Jay

Cyanocorax sanblasianus

French: Geai de San Blas **German**: Acapulcoblaurabe **Spanish**: Chara de San Blas
Other common names: Black-and-blue Jay

Taxonomy. *Pica San-Blasiana* Lafresnaye, 1842, Acapulco, Mexico.
This species and *C. melanocyaneus*, *C. yucatanicus* and *C. beecheii* were formerly placed together in a separate genus, *Cissilopha* (the black-and-blue jays of Middle America). Has been thought to form a superspecies with *C. yucatanicus*. Two subspecies recognized.
Subspecies and Distribution.
C. s. nelsoni (Bangs & T. E. Penard, 1919) – SW Mexico, from Nayarit, Jalisco and Colima S to W Guerrero.
C. s. sanblasianus (Lafresnaye, 1842) – C coastal region of Guerrero, in SW Mexico.



Descriptive notes. 27–35 cm; 92–122 g. Small frontal crest, length and development varying individually; feathers of loral region plush-like and somewhat stiffened, and continuing posteriorly as broad "eyebrow" of such feathering. Nominate race has head, neck and upper mantle black, rest of upperparts, including upperwing, uppertail-coverts and tail, purplish-blue, remiges edged blue on outer webs, greenish on inner webs; underparts black, undertail-coverts and tibia dark purplish-blue, underwing grey, underside of tail blackish; iris yellow; bill black; legs greenish-yellow. Sexes similar. Juvenile is duller than adult, with elongated wispy frontal crest, iris dark brown, bill yellowish, legs brownish; loses crest at end of first year, after which plumage much as adult, bill becoming black early in first year, iris yellowish generally by third year. Race *nelsoni* is somewhat less bright than nominate, upperparts cobalt-blue, lacking purplish tinge, some individuals tinged greenish, male has iris dull greenish-yellow iris (female pure yellow), juvenile retains crest for longer, to third year, than in nominate race does not acquire yellow iris until fourth year (not third). Voice. Chatter call (social call) of *nelsoni* a rather uniform and short nasal sound, that of nominate more sustained and downwardly inflected; this call the most frequently heard vocalization and included in almost any context, may grade into social alarm call in situation of extreme danger. Contact call a resonant "chank chank", by both races. Begging call a sustained and soft "caah", heard from incubating females and from food-begging juveniles. Nominate race has a rattle call to warn of overhead predator, and a resonant and rarely emitted "clank!" in situations in which high levels of conflict would be predicted. Subsong (*sotto voce*) given during courtship display, also in other situations where probable conflict of motivation.
Habitat. Arid to semi-humid forest, palm groves with native woodland or scrub nearby; avoids interior of forest. Also in mangroves and cultivation mixed with woody scrub.
Food and Feeding. Insects, including katydids (Tettigoniidae), small lizards (*Anolis*) and occasionally larger lizards seem to compose bulk of animal items; eats fruits, especially pericarp of palm nuts. Nestlings fed not only with insects, but also with parts of lizards and pieces of orange fleshy pericarp of coconut fruit (*Cocos nucifera*). Forages high in palm fronds, but captures insects also in herbaceous vegetation; forages also at middle and high levels of broadleaf native vegetation, in hedgerows, and in jungle patches. When foraging for palm nuts, sometimes hangs upside-down or flutters upwards to peer into places difficult to reach. Recorded once as active attendant at swarms of army ants (Formicidae). Forages alone during breeding season and in flocks of up 30 individuals at other times. Foraging home range of group maintained by mutual avoidance, rather than by active defence.
Breeding. Eggs and young recorded in Jun and Jul; groups have at least two partly overlapping nesting periods in breeding season. Communal breeder, living in large groups of 13–26 individuals, of which 6–10 breeding pairs and the others helpers; both breeders and non-breeders of the group assist in feeding and defending young; some nests attended by as many as 14 birds, including parents, and nests begun early in season attract more helpers than do later ones, as helpers have to feed increasing number of fledglings (rather than nestlings) as season progresses. Within extensive foraging territory of a large flock there is a smaller breeding area, where pair (especially male) verges on territoriality towards members of own flock; such individual "core areas" not evident in smaller groups. Courtship includes display in which pupils are constricted. Nest built mostly by female of breeding pair, assisted or accompanied by mate, made with twigs and lined with plant fibres and other soft material, those of nominate 9–15 m above ground and almost exclusively in coconut palm (on bract or cluster of coconuts at base of fronds), nests of race *nelsoni* at height of 3–5·5 m. Clutch 3–4 eggs; incubation period 17–18 days; nestling period c. 18–20 days. Success moderate; 22–38% of eggs result in fledglings. Most birds breed first at 3 years of age, but surprising number of immatures (even first-year birds) also breed.
Movements. Sedentary. Indications of occasional vagrancy N to S USA (Arizona).
Status and Conservation. Not globally threatened. Restricted-range species: present in Balsas Region and Interior Oaxaca EBA and North-west Mexican Pacific Slope EBA. Fairly common to locally common, but rather patchily distributed. Home range of one small flock measured 3·1 ha. May occur in disturbed areas, as in mixed cultivation and in native shrubby wooded habitats, but in more natural conditions seems to be rather patchily distributed.
Bibliography. Blake & Vaurie (1962), Clements (2000), Davis (1960), Dickinson (2003), García-Trejo & Navarro Sigüenza (2004), Goodwin (1976), Gordon & Ornelas (2000), Hardy (1961, 1969a, 1973, 1974a, 1974b, 1979, 1984), Hardy & Raitt (1977), Hardy *et al.* (1981), Howell & Webb (1995), Madge & Burn (1994), Phillips (1950), Raitt & Hardy (1976), Remsen *et al.* (2009), Sibley & Monroe (1990), Skutch (1987), Stotz *et al.* (1996), Van Perlo (2006).

22. Yucatan Jay

Cyanocorax yucatanicus

French: Geai du Yucatan **German**: Yucatanblaurabe **Spanish**: Chara Yucateca

Taxonomy. *Cyanocitta yucatanica* A. J. C. Dubois, 1875, Yucatán, Mexico.
This species and *C. melanocyaneus*, *C. sanblasianus* and *C. beecheii* were formerly placed together in a separate genus, *Cissilopha* (the black-and-blue jays of Middle America). Has been thought to form a superspecies with *C. sanblasianus*. Two subspecies recognized.
Subspecies and Distribution.
C. y. rivularis (Brodkorb, 1940) – Tabasco and SW Campeche, in SE Mexico.
C. y. yucatanicus (A. J. C. Dubois, 1875) – SE Mexico (Yucatán, Campeche except SW, and Quintana Roo) S to N Guatemala (Petén district) and N Belize.
Descriptive notes. 31–33 cm; 105–128 g. Head bulky, with short tufted feathers on forecrown. Nominate race has head, neck and upper mantle black, rest of upperparts, including wing and tail, cerulean blue, some individuals tinged bluish above (particularly on tail); underparts black, undertail-

On following pages: 23. Purplish-backed Jay (*Cyanocorax beecheii*); 24. Violaceous Jay (*Cyanocorax violaceus*); 25. Purplish Jay (*Cyanocorax cyanomelas*); 26. Azure Jay (*Cyanocorax caeruleus*); 27. Curl-crested Jay (*Cyanocorax cristatellus*); 28. Tufted Jay (*Cyanocorax dickeyi*); 29. Black-chested Jay (*Cyanocorax affinis*); 30. White-tailed Jay (*Cyanocorax mystacalis*); 31. Cayenne Jay (*Cyanocorax cayanus*); 32. Azure-naped Jay (*Cyanocorax heilprini*); 33. Plush-crested Jay (*Cyanocorax chrysops*); 34. White-naped Jay (*Cyanocorax cyanopogon*); 35. Green Jay (*Cyanocorax yncas*).



coverts and tibia with scattered blue tipping, underside of tail blackish and underwing grey; iris blackish-brown; bill black; legs bright orange-yellow. Sexes similar. Juvenile is distinctive, has entire head and underparts white, upperparts greyish-blue, undersurfaces of wing and tail dull grey, rectrices (except middle pair) white-tipped, bill and legs flesh-yellow, inside of bill white, iris dark, acquires blackish head and body plumage and brighter leg and bill colour during first moult a few weeks after fledging; through first year like dull adult, but has bright yellow bill and orbital ring and retains whitish tips of tail feathers, by second year bill becomes variably mottled (some are black-billed) and orbital ring broken by black, by third year bill black (some pale areas may persist, and even some fourth-year birds show some whitish inside mandibles). Race *rivularis* is slightly larger, lighter, and more silvery blue above than nominate. Voice. Large vocabulary. Most frequently heard is rapid chatter call, a sequence of harsh notes, lower in pitch, and emitted in staccato, given when potential predator nearby, and causes flock-members to congregate (social call), all individuals of flock joining in chorus; in situation of extreme danger, e.g. predator or human touching nest contents, chatter call may grade to a fear call (social alarm call), thinner and less structured, with notes at faster pace; chatter call may grade to a rattle, an avian-predator alarm, more diffuse, with less staccato quality or a less steep wave front to the successive components. Next most often heard is contact call, "chook chook", a sequence of 2–3 melodic notes lower in pitch, given by birds during foraging or moving slowly in loose group. Begging call by adult female ("caah") on nest or by young birds ("squawk"). Also, a group of resonant and guttural calls, e.g. "pleeop", "yelp" and "clank-clank", supposedly emitted in conflict behavioural contexts; all were heard given by flock attending army-ant swarm, and some could be specialized for that context. One or more members of captive flock gave "peyook" call on discovering new food supply. Subsong (*sotto voce*) rare, this possibly associated with dark iris and consequent lack of constricted-pupil display.

Habitat. Edges and clearings of deciduous forest and dense scrubby woodland, from sea-level to 250 m. In Belize and Guatemala lives in pine (*Pinus*) woodland with scrubby undergrowth; recorded also in marsh in Belize (Lamanai). May benefit from habitat disturbance, which increases edge areas. Breeding flocks appear to prefer forest edge, and optimal habitat a mixture of clearings and patches of forest.

Food and Feeding. Stomachs contents in spring indicated about equal proportions of plant and animal items; seeds (especially corn) accounted for most of vegetable material, and arthropods, mostly beetles (Coleoptera) but also Orthoptera, Lepidoptera larvae and flies (Diptera) were primary animal food, with spiders (Araneae), ants (Formicidae) and a mollusc also recorded. During summer, caterpillars and berries the most frequent food items. Some resources, such as cultivated papayas, reached by means of long flights. Examines foliage and branches of all strata, but observations indicate that food acquired mostly from on or near the ground. Usually in flocks of 6–12 individuals, but in winter months sometimes 45–53 (supposedly amalgamation of neighbouring breeding groups); 40–50% of individuals in each flock first-year birds. Usually the flock moves along near forest edge in loose groups, flying or hopping between branches; parts of group may stop to forage briefly on or near ground while others move ahead. Groups recorded as attending army-ant swarms, but not known if such behaviour sporadic, regular or seasonal.

Breeding. Laying in May and Jun, at least; seemingly two sequential or partially overlapping nesting phases in breeding season. Communal breeder, group size 4–15 individuals, including one or two yearlings and, sometimes, one to three two-year-olds; large groups may have two or more simultaneous nests attended by separate units of the flock. In one study, breeding flock stayed within area of 400 m from nest, although territory defence not documented. Helpers seem to participate in nest-building; nest a flimsy platform with shallow cup, composed mostly of sticks inlaid with a few finer twigs or coarse plant fibres, lining never dense (often permitting contents to be viewed from below), placed 4–9 m up in tree, usually close to edge (within 5 m) in upper forest canopy. Clutch 4–6 eggs; incubation by female breeder, fed by male and by several helpers, period 17 days; chicks fed by all group-members, mostly by adult individuals, in captivity nestling period at one nest 26 days. Infestation of nest by fly larvae common, can have adverse effect on nest success.

Movements. Sedentary; movements of up to 4 km seem rare.

Status and Conservation. Not globally threatened. Common to fairly common throughout range. Habitat disturbance has benefited this species.

Bibliography. Blake & Vaurie (1962), Clements (2000), Dickinson (2003), England (2000), Goodwin (1976), Hardy (1961, 1969a, 1973, 1974a, 1974b, 1976, 1979, 1984), Howell & Webb (1995), Madge & Burn (1994), Raitt & Hardy (1976), Remsen *et al.* (2009), Sibley & Monroe (1990), Skutch (1987), Stotz *et al.* (1996), Van Perlo (2006).

23. Purplish-backed Jay

Cyanocorax beecheii

French: Geai à dos violet **German**: Trauerblaurabe **Spanish**: Chara de Beechey
Other common names: Beechey's Jay

Taxonomy. *Pica Beecheii* Vigors, 1829, Montereale = Mazatlán, Sinaloa or San Blas, Nayarit, Mexico. This species and *C. melanocyaneus*, *C. sanblasianus* and *C. yucatanicus* were formerly placed together in a separate genus, *Cissilopha* (the black-and-blue jays of Middle America). Monotypic.

Distribution. Pacific coastal lowlands of NW Mexico from S Sonora (Alamos) S to N Nayarit (S to Sauta).



Descriptive notes. 35–40 cm; 193 g. Head bulky, with stiffened, plush-like feathers extending from forehead and lores above and, to some extent, under eye, conspicuous only when erected. Head, neck, upper mantle and entire underside are black, throat tending to sepia and tibia to dark purplish-blue; upperparts and upperwing bright ultramarine, outer margins of primaries cerulean blue, inner margins blackish, tail indigo-blue; underwing and underside of tail blackish; iris yellow; bill black; legs yellow. Sexes similar. Juvenile has dark grey head and body, distinctly darker hood and almost blackish breast, bluish wings and tail, bill yellowish-horn with white inside, legs dull horn, iris dark brown; at c. 3·5 months resembles adult, legs become yellow in first year, bill acquires some black (starting from base) during second year, becoming completely black (pale patches remain on inside) in third year, iris becomes gradually greenish-yellow in second year and yellow in third year. Voice. Seems to have limited vocal repertoire. Frequently utters a *Corvus*-like vocalization, a harsh cawing call (social call), "ahhr" or "ehrrr", variable in cadence, amplitude and configuration, variations supposedly related to motivation level of individual (intriguingly, sympatric *Corvus sinaloae* said to have a call similar to that of several species in present genus); in extreme alarm, as when predator too close to eggs, gives a variation of cawing call (social alarm call), with more frequency modulation. Subsong (*sotto voce*) complex, given during courtship. Other vocalizations, rarely recorded in the field and of unknown context, "clok clok clok", "peep!", "pook", and a longer so-called "crying call".

Habitat. Lowland and foothill dry deciduous forests, especially secondary growth, from sea-level to 600 m; also coastal scrub and mangroves. Seems to be associated with interior of forests more than are its congeners in Middle America.

Food and Feeding. Variety of invertebrates, including mosquitoes (Culicidae), winged termites (Isoptera) and ants (Formicidae), cockroaches (Blattodea), cicadas (Cicadidae), larval and adult Lepidoptera, beetles (Coleoptera) and spiders (Araneae); also small lizards (*Anolis*) and small rodents; also fruits, especially mangoes (*Mangifera*), berries, and grain (both from growing corn and that spilt on roadside and railway lines). Recorded as taking discarded tortillas from refuse dumps. Appears to be more omnivorous than congeners in Middle America, e.g. *C. yucatanicus* (hypothesized that more varied diet combined with larger body size would be an adaptation to seasonally low food supply). Several foraging techniques used, from gleaning foliage, probing bark and searching among leaf litter on forest floor to brief bouts of hawking for flying insects. Forages in small flocks of 2–6 individuals (breeding pair and helpers), preferring forest interior over forest edge; forages from ground up to canopy, with approximately equal numbers of observations of birds foraging on ground and in trees. Flock mobility high, individuals seldom spending long periods at one site; flights of more than 100 m recorded.

Breeding. Laying recorded in first half May; one brood per year. Social breeder, occasional solitary nesting recorded (perhaps when low population density); each group has only one active nest at one time, parenthood within group confined to adult of each sex 3 years or more old; all members of group assist in nest defence and in feeding of chicks and fledglings; helpers can be yearlings, 2-years-old or adults. Hostile interactions between birds of different groups, suggesting territorial defence. All members of group contribute to nest construction, mated female doing bulk of work; nest a rather untidy platform of twigs, sparingly lined with finer twigs, built 4–7·6 m up in tree that retains leaves throughout dry season (e.g. *Zizyphus*, *Trichilia trifolia*). Clutch 3–6 eggs, average 5; incubation solely by breeding female, fed by mate, period c. 18–19 days; male "guards" nest in short absences of female, but rarely waits for her return; estimated nestling period 22–25 days. Most important nest predators are Mexican beaded lizards (*Heloderma horridum*), snakes, and *Callocitta colliei*; lesser predators include squirrels (Sciuridae), hawks (Accipitridae), owls (Strigidae), *Corvus* species, and possibly jaguarundi (*Puma yagouaroundi*).

Movements. Sedentary.

Status and Conservation. Not globally threatened. Restricted-range species: present in Northwest Mexican Pacific Slope EBA. Fairly common, but local. Has low population density, flocks appear to occupy home ranges of 25–43 ha; few nests per group, and high number of nest predators. Requires primary forest; although it forages in secondary growth, has disappeared from clear-cut areas. Extensive areas of native deciduous forest in Sonora and N Sinaloa have been destroyed in recent years. Has been suggested that this species could become threatened in coming decades because it is restricted to dry lowland forest and its habitat has no protection at all.

Bibliography. Blake & Vaurie (1962), Clements (2000), Dickinson (2003), Escalante & Néquiz (2004), García-Trejo & Navarro Sigüenza (2004), Goodwin (1976), Gordon & Ornelas (2000), Hardy (1961, 1969a, 1973, 1974a, 1979, 1984), Howell & Webb (1995), Madge & Burn (1994), Peterson & Navarro Sigüenza (2000), Raitt & Hardy (1979), Raitt *et al.* (1984), Remsen *et al.* (2009), Sibley & Monroe (1990), Skutch (1987), Stotz *et al.* (1996), Van Perlo (2006), Winterstein & Raitt (1983).

24. Violaceous Jay

Cyanocorax violaceus

French: Geai violacé **German**: Hyazinthblaurabe **Spanish**: Chara Violácea

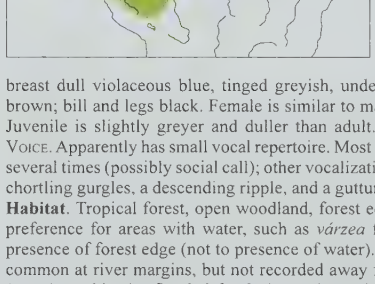
Taxonomy. *Cyanocorax violaceus* du Bus de Gisignies, 1847, Pebas, River Marañón, Loreto, eastern Peru.

Has been thought to form a superspecies with *C. cyanomelas*, *C. caeruleus* and *C. cristatellus*. Two subspecies recognized.

Subspecies and Distribution.

C. v. pallidus J. T. Zimmer & Phelps, Sr, 1944 – N Venezuela (coast of Anzoátegui).

C. v. violaceus du Bus de Gisignies, 1847 – SW & S Venezuela and SW Guyana S to E Peru (S to Madre de Dios and Puno), N Bolivia (Panda and La Paz) and N Brazil (E to upper R Negro and lower R Purús).



Descriptive notes. 33–37 cm; 262 g. Slight frontal crest of erect but short nasal plumes and forehead feathers, and feathers of lores, malar region and eye stiffened; some have longer feathers on crown. Male nominate race has forecrown blackish, crown, side of head, side of neck, throat and upper breast sepia, nape mauvish-white, shading to pale bluish-mauve on hindneck; upper mantle white, heavily tinged dull violaceous blue, rest of upperparts pure dull violaceous blue, tail indigo-blue; upperwing bright dull violaceous blue, primaries blackish with have dull violaceous blue on outer margins; underparts below upper breast dull violaceous blue, tinged greyish, underwing and underside of tail blackish; iris dark brown; bill and legs black. Female is similar to male, but underparts more heavily tinged greyish. Juvenile is slightly greyer and duller than adult. Race *pallidus* is paler overall than nominate. Voice. Apparently has small vocal repertoire. Most frequent call a loud "jyeeeer!" or "jeeer", emitted several times (possibly social call); other vocalizations include "clop-clop-clop-clop", various quiet chortling gurgles, a descending ripple, and a guttural clicking. Harsh note as juvenile begging call.

Habitat. Tropical forest, open woodland, forest edge, and secondary growth. Reported as having preference for areas with water, such as *várzea* forest and mangrove, but this presumed due to presence of forest edge (not to presence of water). In study site of 800 ha in Brazil (W Amazonas) common at river margins, but not recorded away from river in high forest; forest at river margins (*igapó*) at this site flooded for 3–4 months each year and strip-width 50–250 m. Ventures into

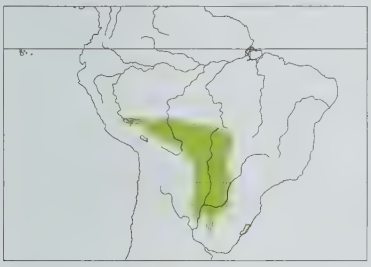
plantations. Lowlands to 1350 m; in Serranía de los Churumbelos (S Colombia) recorded at 350–1100 m, and in Tinigua National Park (N Colombia) at 350–400 m.
Food and Feeding. Insects and fruits. Forages through middle and upper canopy; detailed study in Venezuela showed strong association with canopy (above 18 m). Takes items by hopping and picking. Seen to perch frequently in *Cecropia* along rivers in noisy and active groups of 6–12 individuals; flock-members move one by one across forest clearings and rivers. Sometimes associates with large mixed foraging flocks of oropendolas (*Psarocolius*) and caciques (*Cacicus*).
Breeding. In Venezuela, one nest with eggs in early Apr in Orinoco basin and two large young observed in Jul in *llanos*. Lives in flocks throughout year; presumably a social breeder, but documentation not available. One nest found, a bulky structure of sticks and twigs, lined with plant fibres, c. 9 m up at top of edge tree in mangrove. One clutch of 5 eggs, laid on consecutive days. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Common to fairly common in much of range; uncommon to locally fairly common in Venezuela.
Bibliography. Blake & Vaurie (1962), Cadena *et al.* (2000), Clements (2000), Clements & Shany (2001), Davis *et al.* (1994), Dickinson (2003), Goodwin (1976), Haffer (1975, 1992), Hardy (1961, 1969a, 1969b, 1984), Hilty & Brown (1986), Hornbuckle (1999), von Ihering & von Ihering (1907), Madge & Burn (1994), Meyer de Schauensee (1966, 1970), Meyer de Schauensee & Phelps (1978), Moscovits *et al.* (1985), Naka *et al.* (2006), Parker & Remsen (1987), Parker *et al.* (1991), Peres & Whittaker (1991), Pinto (1944), Remsen *et al.* (2009), Restall *et al.* (2006), Ridgely & Tudor (1989), Ruschi (1979), Salaman *et al.* (1999), Sibley & Monroe (1990), Sick (1985, 1986, 1997), Sigrist (2006), da Silva (1998), Snethlage (1914), Souza (2004), Stotz (1997), Stotz *et al.* (1996), Walther (2002).

25. **Purplish Jay**

Cyanocorax cyanomelas

French: Geai bleu-noir **German**: Purpurblaurabe **Spanish**: Chara Morada

Taxonomy. *Pica cyanomelas* Vieillot, 1818, Paraguay.
Possibly forms a superspecies with *C. caeruleus*; has been suggested that *C. violaceus* and *C. cristatellus* could be members of same superspecies. Monotypic.
Distribution. Extreme SE Peru (Cuzco and Madre de Dios), N & E Bolivia, Paraguay, SW Brazil (S Rondônia, Mato Grosso, Mato Grosso do Sul, SW Goiás, extreme W São Paulo and extreme W Paraná), N Argentina (E Formosa, E Chaco, N Corrientes, N Santa Fé and Misiones) and extreme NW Uruguay (Artigas). One recent and isolated record in C São Paulo.



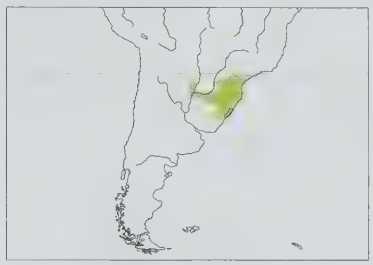
Descriptive notes. 37 cm; 185–210 g. Short black frontal crest and nasal tuft, and stiff feathers on lores, malar region and around eye. Has anterior half of crown and side of head sepia, posterior half of crown, nape and hindneck dark drab brown, hindneck slightly tinged violet, side of neck, throat and breast brownish-black; rest of body dull bluish-purple with brownish wash; upperwing violet, inner margin of primaries brownish, tail dark violet; underwing brownish, undertail blackish; iris dark brown; bill and legs black. Sexes similar. Juvenile is paler and duller than adult. Voice. Vocal repertoire seems small, primarily of harsh sounds. Repeated harsh "jar-jar-jar-jar" or "craa-craa-craa-craa" the loudest call (audible to 150 m) and the most common vocalization heard (social call); highly motivated individuals tend to emit shorter notes at faster rhythm. Other shorter harsh notes, with variations, given usually during foraging (contact call), not audible beyond 30 m; this call resembles to some extent those of *Corvus*.
Habitat. Deciduous forest, gallery forest and adjacent areas of scrub and secondary forest, with xerophytic features; mainly lowlands, but has been recorded to 2000 m. Commonly in areas with sparse trees and isolated patches of forest in the Pantanal region (Brazil) and *cerrado* (Brazil, Bolivia and Paraguay). Was considered among the five most abundant bird species in *chiquitano* (xeric forest similar to *chaco* but with stratification rivalling that of the Amazonian forest) at a study site at W Bolivia.
Food and Feeding. Invertebrates, fruits and berries; probably takes contents of other birds' nests; probably feeds also on carrion. Group of six individuals observed to prey on nest of social wasps (Vespidae) in Pantanal; seen to be chased by Hyacinth Macaw (*Anodorhynchus hyacinthinus*) from latter's nest. Forages in small flocks of 6–8 individuals in all forest strata, but prefers canopy; frequently seen on the ground; commonly makes long flights over open areas. Forages often in company with *C. chrysops*, and both species recorded in mixed-species flock at swarm of ants (Formicidae) in a dry forest in Paraguay. Associates also with large icterids (Icteridae).
Breeding. Eggs recorded from early Oct to early Dec in Paraguay and Nov in Argentina. One nest described, built with twigs and creeper stems, lined with leaves, placed 3 m above ground in low tree covered with creepers. Clutch 2–6 eggs, chiefly 3 or 4; no information on incubation and nestling periods.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Generally fairly common. Locally common in Paraguay and Argentina; rare in Peru. It is possible that deforestation has allowed an expansion of its geographical distribution in W São Paulo (Brazil).
Bibliography. Azpiroz (2006), Barnett & Pearman (2001), Blake & Vaurie (1962), Brooks *et al.* (2005), Brumfield *et al.* (2004), Cavalcanti & Marini (1993), Clements (2000), Clements & Shany (2001), Dickinson (2003), Dubs (1992), Flores *et al.* (2001), Goodwin (1976), Hardy (1961, 1969a, 1984), Hayes (1995), Hayes & Scharf (1995a, 1995b), Hennessey *et al.* (2003), von Ihering & von Ihering (1907), MacLeod *et al.* (2005), Madge & Burn (1994), Madroño *et al.* (1997), Mercado (1985), Meyer de Schauensee (1966, 1970), Narosky & Yzurieta (2003), Nores (1992), Oniki & Willis (1999), Pinho & Nogueira (2003), Pinto (1944), Remsen *et al.* (2009), Ridgely & Tudor (1989), Robbins *et al.* (1999), Ruschi (1979), Scherer-Neto (1983), Scherer-Neto & Straube (1995), Sibley & Monroe (1990), Sick (1985, 1986, 1997), Sigrist (2006), Souza (2004), Stotz *et al.* (1996), Straube & Bornschein (1995), Straube *et al.* (1996), Tubelis & Tomás (1999, 2003), Wetmore (1926), Willis & Oniki (1990, 1993, 2003), Zyskowski *et al.* (2003).

26. **Azure Jay**

Cyanocorax caeruleus

French: Geai azuré **German**: Azurblaurabe **Spanish**: Chara Cerúlea

Taxonomy. *Pica caerulea* Vieillot, 1818, Paraguay.
Possibly forms a superspecies with *C. cyanomelas*; it has been suggested that *C. violaceus* and *C. cristatellus* could be members of same superspecies. Monotypic.
Distribution. S & SE Brazil (Rio Grande do Sul, Santa Catarina, Paraná, SE São Paulo), extreme E Paraguay, NE Argentina (Misiones, Corrientes, Chaco, Formosa) and NE Uruguay (Cerro Largo).



Descriptive notes. 38 cm; 272 g. Small bristly frontal crest formed by long stiffened feathers of forehead; two morphs, differing in blue tone of body plumage. Has forecrown blackish, crown, nape, side of head, side of neck, throat and breast sepia; remainder of plumage, including outer margins of primaries, tending to bright cerulean blue on some individuals and to bright ultramarine-blue on others; inner margins of primaries brownish, as are underwing and undertail; iris dark brown; bill and legs black. Sexes similar. Juvenile has back, wings and tail purplish-blue, underparts and rump indigo, and a yellow spot close to base of lower mandible (still visible on juvenile at 6 months). Voice. Total of 14 basic calls identified in detailed study. Basic calls may grade into intermediate ones during change in motivation level of individual. Typical vocalization an inflected and melodic note, repeated several times, "caa-caa-caa" (social call), audible at up to 200 m, given in territory defence, flock movements, and flock congregation; shorter, slightly inflected variant delivered more quickly by highly excited individuals, as when mobbing (social alarm call). Also has *Corvus*-like harsh sound, when individuals foraging in forest (contact call), audible to 50 m. Flight call a variation of contact call. Imitations of birds of prey given. Other vocalizations, rarely heard, are quiet and associated with agonistic contexts. Subsong (*sotto voce*) commonly heard and frequent during courtship (courtship call); can be emitted also by solitary individuals. Vocalizations resemble those of *C. cristatellus* and *C. cyanomelas* because of harsh notes, quite different from those of *C. chrysops*.
Habitat. Interior and edges of tropical and subtropical forests; commonly associated with temperate forest, where the conifer *Araucaria angustifolia* the dominant tree, but found also in other types of forest, such as tropical lowland forest on coast. In S Brazil inhabits natural patches of southern temperate forest (*capões*) in grassland regions (to reach these isolated patches flock makes uninterrupted flight of 1000 m over grassland); recorded in mangrove and also on islands (covered by forest) 2 km from coast in Paraná (S Brazil). Frequent also in secondary forest not far from primary forest. Breeding territories often close to small hill with stream nearby.
Food and Feeding. Seeds, fruits; also animal items, including beetles (Coleoptera), Formicidae (the ants *Labidus praedator* and *Crematogaster* recorded in stomach), Gonyleptidae (Opiliones), spiders (Araneae), mantis (Mantodea), the crab *Pachygrapsus transverses*, passerine eggs and nestlings, and adult small birds; takes eggs of domestic hens and fresh meat around human settlements. Feeds almost exclusively on seeds of *Araucaria angustifolia* (taken directly from tree) during autumn–winter (Apr–Jul) in temperate forest; in tropical lowland forest (where *Araucaria angustifolia* absent) and at other seasons in temperate forest, feeds on fruits of Myrtaceae (*Campomanesia* and *Eugenia uniflora*), Rosaceae (*Prunus sellowii*), Moraceae (*Ficus* and *Coussapoa microcarpa*), Myrsinaceae (*Rapanea ferruginea*), Solanaceae (*Solanum pseudoquina*), and Lauraceae; fruits of the palm *Euterpe edulis* seem to be an important item in tropical lowland evergreen forest; seeds of a Magnoliopsida and fibres of Magnoliophyta also recorded. Seen to visit maize (*Zea mays*) plantations; other cultivated items recorded are *Ipomoea batata* (Convolvulaceae), *Eriobotrya japonica* (Rosaceae), *Musa paradisiacal* (Musaceae). One seed of pine (*Pinus*), an exotic tree species in Brazil, was found in one stomach. Seen to conceal seed of *Araucaria angustifolia* at base of branches in taller trees, but no records of recovering food; in captivity, individuals regularly hid food, usually not on ground, and recovered it later. In studies in southern temperate forest, flocks of 3–9 individuals foraged in canopy, sometimes in subcanopy; rarely recorded below 2 m or on ground. Where sympatric with *C. chrysops* (most of range) tends to stay mostly in canopy, while that species forages in subcanopy and understorey. During foraging, maximum individual distance within group often 50 m; when foraging for mature seeds of *Araucaria* can form subgroups (2–4 individuals each), which feed up 200 m from one another. One observation of a group attending ants (Formicidae) in mixed flock with Rufous-bellied Thrush (*Turdus rufiventris*), Yellow-legged Thrush (*Turdus flavipes*), Squirrel Cuckoo (*Piaya cayna*), Planalto Woodcreeper (*Dendrocolaptes platyrostris*), and Black-goggled Tanager (*Trichothraupis melanops*); individuals seen very close to the ground.
Breeding. Nests found Oct–Jan. Social breeder; helpers at nest seen to mob a Roadside Hawk (*Buteo magnirostris*). Nest of sticks and large twigs, inner cup lined with roots and fibrous materials (probably from some epiphyte), external diameter 40–50 cm (one with more oval shape, 55 × 35 cm) and height 18–19 cm, internal diameter 16–19 cm and depth 6–9 cm; in temperate forest placed 10–20 m up in *Araucaria angustifolia* (mostly young trees) or in Lauraceae tree; territory estimated at 9–12 ha in temperate forest, seemingly smaller in tropical lowland forest. Clutch 2–4 eggs; estimated incubation period 17–21 days and nestling period 18 days.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Locally common to uncommon or rare; declining. Estimated home range of flock large, 30–40 ha. In Paraguay a single confirmed record of a pair in extreme E (close to Ciudad del Este), but no recent records; old records questionable, and several instances of published records and museum specimens from Argentina and Paraguay relate to misidentified *C. cyanomelas*. Rare in Argentina; in Misiones, where there are more records (but still considered rare), occurs patchily, apparently where groups of *Araucaria angustifolia* are present. In southern temperate forest of Brazil rarer than in lowlands of Atlantic forest near coast. Owing to habitat degradation, this species has become extinct in some areas where previously recorded, e.g. near Porto Alegre, in S Brazil. In contrast, appears to be increasing, unexpectedly, on island of Santa Catarina (S Brazil), where now common in urban areas and secondary forest. Recently recorded at R Yaguarón (Cerro Largo) in NE Uruguay. This species contributes to the dispersal of *Araucaria angustifolia*, as it often does not retrieve dropped seeds. Seeds of this tree exploited for human consumption in S Brazil, and thousands are taken from the trees each year; this could have adverse impact on present species, as it is highly dependent on *Araucaria* seeds during winter. Although it lives at forest edge, forest fragmentation seems another factor in the population decline; presence of primary forest within its range appears to be important.
Bibliography. Accordi (2001), Albuquerque & Brüggemann (1996), dos Anjos (1988, 1989, 1991, 1995), dos Anjos & Bóçon (1999), dos Anjos & Graf (1993), dos Anjos & Schuchmann (1997), dos Anjos & Uejima (1994), dos Anjos & Vielliard (1993), dos Anjos *et al.* (1997), Anon. (2008p), Azpiroz (2006), Barnett & Pearman (2001), Belton (1985), Bencke & Kindel (1999), Bencke *et al.* (2006), Blake & Vaurie (1962), Bodrati & Cockle (2006), Bornschein *et al.* (1996), Butchart & Stattersfield (2004), del Castillo & Clay (2004), Chebez (1992), Clements (2000), Cordeiro (2001), Dickinson (2003), Fraga (1997), Gliesch (1930), Goodwin (1976), Hardy (1961, 1969a, 1969b, 1984), Hayes (1995), Hellmayr (1906), von Ihering & von Ihering (1907), Madge & Burn (1994), Marsden *et al.* (2003), Meyer de Schauensee (1966, 1970), Naka & Rodrigues (2000), Naka *et al.* (2002), Narosky & Chebez (2002), Narosky & Yzurieta (2003), Pereyra (1951), Piacentini & Campbell-Thompson (2006), Pichorim & Bóçon

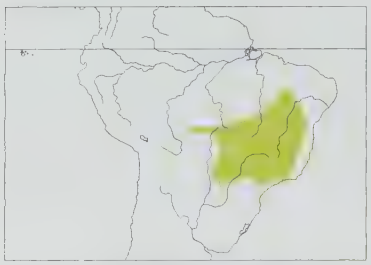
(1996), Pinto (1944), Reinert & Bornschein (1998), Remsen *et al.* (2009), Ridgely & Tudor (1989), do Rosário (1996), Ruschi (1979), Scherer-Neto & Straube (1995), Sibley & Monroe (1990), Sick (1985, 1986, 1997), Sigrist (2006), Souza (2004), Stattersfield & Capper (2000), Stotz *et al.* (1996), Straube (1988, 1990, 1993), Sztolcman (1926), Willis & Oniki (2003).

27. Curl-crested Jay

Cyanocorax cristatellus

French: Geai à plumet **German**: Krauskopf-Blaurabe **Spanish**: Chara Crestada

Taxonomy. *Corvus cristatellus* Temminck, 1823, Ipanema, São Paulo, Brazil.
Formerly placed in a monotypic genus, *Uroleuca*. Has been thought to form a superspecies with *C. violaceus*, *C. cyanomelas* and *C. caeruleus*. Monotypic.
Distribution. Brazil (S Pará, S Maranhão, S Piauí and W Bahia S to Mato Grosso do Sul and NE Paraná), extreme CE & NE Paraguay (Concepción and Canindeyú) and extreme E Bolivia (NE Santa Cruz).



Descriptive notes. 35 cm; 178 g. Distinctive, with long, recurved black frontal crest; short nasal tuft. Forehead, crown and side of head are black, nape, side of neck, throat and breast sepia; upper mantle sepia, becoming washed cyan-blue towards rump, rump almost pure cyan-blue; upperwing bright cyan-blue, primaries with outer margins cerulean blue and inner margins blackish; underparts below breast whitish, on some individuals washed cream and on others washed grey; underwing brownish, whitish underwing-coverts; basal half of tail bright cyan-blue above and blackish below, rest white (or whitish) on both surfaces; iris dark brown; bill and legs black. Sexes similar. Juvenile is duller than adult, with shorter and less curled crest, terminal third of tail washed mauve, wing-coverts tipped brownish. Voice. Repertoire resembles that of *C. caeruleus*. Farthest-carrying (at least 200 m) vocalization a melodic and inflected note, "kyaar", repeated several times by individuals during territorial defence, flock movements, and congregation (social call); similar, but shorter call, "kyap", constantly emitted, usually by all individuals in flock, in situation of extreme excitement, as when mobbing bird of prey (social alarm call). Quite variable harsh note, like that of *Corvus*, audible to less than 50 m, given during foraging by flock-members (contact call). Begging call resembles contact call, but longer. Other vocalizations, rarely heard, are related to agonistic behaviour. Subsong (*sotto voce*) recorded.
Habitat. Dry forest of *cerrado*; also in riparian forest, forest edge and grassland areas with sparse covering of shrubs and trees. At 150–1100 m. Can be found in many modified landscapes, such as edge of eucalypt (*Eucalyptus*) plantations and gardens very close to cities; has benefited from logging. Overlaps widely with *C. cyanopogon*; in study in NE Minas Gerais, in a transect from *cerrado* to *caatinga*, present species was progressively replaced by *C. cyanopogon*; in another study site, in SE Tocantins, was significantly more numerous than that species in *cerrado*.
Food and Feeding. Insects (47%), fruits (40%), nectar (12%) and small vertebrates (1%) recorded as food for four groups studied in C Brazil. Among fruits consumed are *Shefflera macrocarpa*, *Psitacanthus robustus*, *Caryocar brasiliense*, *Syagrus flexuosa*, *Eugenia calycina*, *Copaifera langsdorffii*. Among 13 bird species that visited three flowering trees of *Caryocar brasiliense*, present species remained for longest mean time (more than 3 minutes); groups of 3–6 probed flowers. Also, in Brazil, reported as preying on nest of a social wasp (*Apoica pallens*) near Brasília, and recorded as preying on eggs of Ruddy Ground-dove (*Columbina talpacoti*) and nestling of Sayaca Tanager (*Thraupis sayca*) in São Paulo. Observations of four flocks (9–11 individuals) in C Brazil indicated that chief vegetation layer used during foraging was above 4 m (64% of events), then shrubby vegetation (29%), and lowest layer (7%), and most frequent foraging technique was gleaning (59%), followed by sallying (25%), then hanging, hammering, and taking insects in steady flight; foraged mainly in morning (06:00–10:00 hours) and later afternoon (14:00–18:00 hours). Sentinel behaviour quite evident during foraging, accounting for 50% of total activity time during day; sentinels generally use high perches (5–10 m up), most frequently selecting *Dalbergia miscolobium* as lookout post. In Bolivia, this jay species was observed in groups of 6–9 individuals. May associate with flocks of *Ramphastos* toucans.
Breeding. Breeds Sept–Mar in Brazil; observations suggest more than one nest per season in each group. Social breeder, with helpers. Nest cup-shaped, built with twigs (diameter 0·7 cm), lined with thin vegetation such as lianas and roots, external diameter 47·4 cm, depth 15·4 cm, internal diameter 15·8 cm and depth 6·5 cm; placed 2·7–6·6 m up in tree (of 18 nests in Brazil, eleven were in *Caryocar brasiliense*); territory size 20–41 ha in C Brazil, although true defensive behaviour observed only around nest. Clutch 5–6 eggs; incubation by breeding female, period 18–20 days; chicks brooded by more than one individual, fed by at least four, nestling period c. 24 days.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Common. Home range of group estimated at 172 ha, territory per active nest c. 29 ha. Although *cerrado* is suffering drastic alterations, this species remains common. It has benefited from logging activities, and has expanded its range; in SE Brazil has extended E in São Paulo and S in Rio de Janeiro (Serra dos Órgãos), and in SE Paraguay reported by local native Indians in Department of Canindeyú.
Bibliography. Aleixo & Vielliard (1995), Allen (1891), Almeida *et al.* (1999), Alvarenga (1990), Amaral & Macedo (2003), Bates *et al.* (1992), Bencke *et al.* (2006), Blake & Vaurie (1962), Blamires *et al.* (2002), Braz & Cavalcanti (2001), Cavalcanti & Marini (1993), Clements (2000), de Faria (2007), Dickinson (2003), Donatelli, da Costa & Ferreira (2004), Donatelli, Ferreira *et al.* (2007), Dubs (1992), Faria *et al.* (2006), Galetti & Pizo (1996), Goodwin (1976), Hardy (1961, 1969a, 1969b, 1984), Hayes (1995), Henriques & Palma (1998), von Ihering & von Ihering (1907), Laubmann (1939), Madge & Burn (1994), Madroño & Esquivel (1997), Mallet-Rodrigues *et al.* (2007), Melo (2001), Melo-Júnior *et al.* (2001), Meyer de Schauensee (1966, 1970), Olmos & Brito (2007), Pacheco & Olmos (2005, 2006), Parrini *et al.* (1999), Pinto (1944), Pizo (2004), Remsen *et al.* (2009), Ridgely & Tudor (1989), Robbins *et al.* (1999), Rodrigues *et al.* (2005), Ruschi (1979), Scherer-Neto & Straube (1995), Sibley & Monroe (1990), Sick (1985, 1986, 1997), Sigrist (2006), Souza (2004), Stotz *et al.* (1996), Tubelis & Cavalcanti (2000), Tubelis & Tomás (2003), de Vasconcelos & Melo-Júnior (2001), Willis (2003), Willis & Oniki (1990, 1991, 2003).

28. Tufted Jay

Cyanocorax dickeyi

French: Geai panaché **German**: Schopfblaurabe **Spanish**: Chara Pinta
Other common names: Dickey's Jay

Taxonomy. *Cyanocorax dickeyi* R. T. Moore, 1935, Rancho Batel, 5 miles [8 km] north-east of Santa Lucia, 5200 feet [1585 m], Sinaloa, Mexico.
Has been suggested as forming a superspecies with *C. chrysops* and *C. cyanopogon*; another suggestion is that its nearest relative may be *C. mystacalis*. Monotypic.
Distribution. Pacific slope of Sierra Madre Occidental (SE Sinaloa, NE Nayarit and SW Durango), in W Mexico.



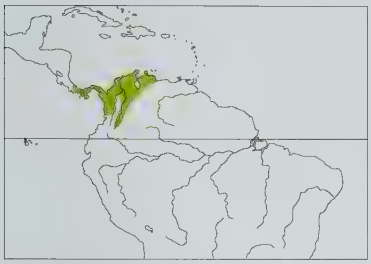
Descriptive notes. 37 cm; 160–185 g. Distinctive, with prominent stiff, bristly, fan-shaped crest over crown starting at base of bill. Forehead and crest are black, crest feathers becoming dark blue towards bases; large white rounded patch above eye and very extensive white patch on cheek and malar region (both facial patches bluish at edges), black loral region, throat and upper breast, and black stripe extending from rear crown down side of neck and meeting black of upper breast; nape, hindneck, upper mantle, lower side of neck and underparts from lower breast white, rest of upperparts indigo-blue; upperwing-coverts indigo-blue, outer margins of primaries bright cyan-blue, inner margins blackish; tail bright cyan-blue at base and white on terminal part (terminal half of central feathers white, widening to terminal two-thirds on outermost); iris bright yellow; bill and legs black. Sexes similar. Juvenile has short crest, blue patch on side of head (lacks patch above eye), dark iris and flesh-coloured base of bill; bill becomes black after few months of life, and iris becomes yellow early in following year, second-year birds like adult. Voice. Very large repertoire well studied. Most typical vocalization a staccato double "chuk-chuk" or "ca-ca-ca-ca", highly variable and used in several situations, as by incubating female or during feeding movements (social call); rapid high-pitched version, but with more notes, used by all members of flock in defence of nest or young (social alarm call). During flock movements "ped-el" (contact call) and, more rarely, "wheeuh" (uncertain meaning). Low-intensity, nasal "aaagh", emitted with the bill closed, by individuals near each other, as during resting periods, when one perches among others, or birds bringing food for female or young. Begging call similar to harsh sound of *Corvus* crows, given by young and by incubating females when accepting food from another flock-member. Vocalizations by males "guarding" nest site while female incubating include, among others, highly metallic ricochet sound, low-intensity "tuk" (repeated in quick sequence of 5 notes), double "tst". Mimicry of Blue Mockingbird (*Melanotis caerulescens*) and grackles (Icteridae) recorded. Subsong (*sotto voce*) during courtship display.
Habitat. Hilly areas with mixed deciduous and evergreen forest, close to watercourses in lower valley bottoms (riparian forest), and on ridges with oak (*Quercus*) and mixed oak–pine (*Quercus–Pinus*) areas; 1350–2150 m. Commonly seen in oak and pine–oak areas during autumn, apparently attracted by acorn crop.
Food and Feeding. Plant material (70%), including acorns, plant fibres, seeds and fruits; animal items (30%), including insects, mainly beetles (Coleoptera) and Orthoptera, arachnids, and also eggs and nestlings of other bird species. Obtains food in trees, particularly in canopy, and hardly ever seen on ground; may pluck berries from thin twigs while hovering momentarily. Large items not eaten in place where captured. Foraging individuals investigate bromeliads (particularly *Tillandsia*) and other epiphytes, tearing them apart to retrieve berries, seeds and acorns from inside cupped leaves (uncertain whether fallen in or previously hidden food); will hang briefly upside-down and hover while feeding. Agave inflorescences and grassy rocks also hold special interest; visits flowers to catch insects drawn to nectar. In flocks of 4–16 individuals; larger flocks found in extensive areas of wide ravines supporting continuous stretches of large shade trees with dense understorey vegetation; flocks (especially large ones) tend to break up into small units when breeding season approaches. Morning feeding movements (2·5–7·8 km) last for 4·5 hours, followed by several hours of preening or resting in large trees; another feeding bout in early afternoon until dusk, usually terminating at roosting area; during breeding, these two feeding bouts replaced by short feeding trips from nest. When acorns not available, foraging time 50% in mixed broadleaf barranca trees, 25% in pure oak stands or oak with associated broadleaf, 15% on cliffs with grass and agave, and 10% in pine and pine–oak.
Breeding. Laying Apr and early May. Social breeder, with up to at least ten helpers, including first-year individuals; only one breeding pair in flock. Helpers participate in nest-building; large, bulky nest fairly well constructed from larger sticks, with smaller twigs towards interior, lined with fine twisted rootlets of epiphytic plants, outside diameter 33–53 cm, height 15–28 cm, internal diameter 13–16·5 cm, depth 5–7·6 cm, placed 5–15 m above ground in densely foliaged tree, in broadleaf vegetation, close to flooded area in watercourse; old nests usually found in same area, but apparently not reused. Clutch 2–5 eggs; incubation by female breeder, fed at nest by male and several helpers, period 18–19 days; chicks fed by male and helpers, nestling period 24 days; fledglings fed by all (or most) of group.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Sierra Madre Occidental and Trans-Mexican Range EBA. Uncommon to fairly common within its small global range. Limited geographical distribution (estimated at 8250 km²) and forest-dependent habits could put this species at risk in the near future. In Mexico listed as endangered, because there are no designated protected areas within its range. It has recently been suggested that this species should perhaps be considered globally threatened.
Bibliography. Anon. (2008p), Blake (1953), Blake & Vaurie (1962), Butchart & Stattersfield (2004), Clements (2000), Crossin (1967), Dickinson (2003), Escalante & Néquiz (2004), Goodwin (1976), Hardy (1961, 1969a, 1984), Howell & Webb (1995), Madge & Burn (1994), Moore (1935, 1938), Peterson & Navarro Sigüenza (2000), Remsen *et al.* (2009), Sibley & Monroe (1990), Skutch (1987), Stattersfield & Capper (2000), Stotz *et al.* (1996), Van Perlo (2006), Verbeek (1973).

29. Black-chested Jay

Cyanocorax affinis

French: Geai à poitrine noire **German**: Schwarzbrust-Blaurabe **Spanish**: Chara Pechinegra

Taxonomy. *Cyanocorax affinis* Pelzeln, 1856, "Bogota" [Colombia].
Two subspecies recognized.
Subspecies and Distribution.
C. a. zeledoni Ridgway, 1899 – extreme SE Costa Rica (Caribbean slope) and tropical and subtropical zones of Panama.
C. a. affinis Pelzeln, 1856 – N & NE Colombia (S to R San Juan and Huila) and NW Venezuela (Zulia, Táchira, Mérida, Trujillo, W Lara and Falcón).



Descriptive notes. 33–36 cm; 194–232 g. Feathers on forehead, together with nasal plumes, stiffened and forming short, more or less laterally compressed frontal crest. Male nominate race has head mostly black, with large elongated blue spot above eye, smaller (half the size) blue spot below eye, blue malar stripe; nape bright cyan-blue, often partly concealed by crown feathers; upperparts dull violet suffused with brown, especially on mantle and back, uppertail-coverts cyan-blue; upperwing bright cyan-blue, inner margins of primaries dark brown, tail also bright cyan, tips of all rectrices whitish-cream; throat and upper breast sepia, rest of underparts whitish, underwing whitish, underside of tail dusky; iris yellow or yellowish-white; bill and legs blackish. Female is similar to male, but tends to be more brownish on mantle and back. Juvenile is duller and browner than adult, wings predominantly dark purplish-brown (rather than violet-blue), malar stripe duller and less conspicuous, blue spots above and below eye absent or vestigial. Race *zeledoni* has underparts and tail tips more creamy than nominate, throat and upper breast tend towards black, the bright blue of nape more visible, wings and tail brighter blue, back sometimes tinged cyan-blue. Voice. Repertoire quite varied, of harsh, squeaky and metallic short notes. Social call transcribed as "peeeoh", which may grade into "cheoo!"; chatter call (social alarm call) a sequence of notes as "pyou-pyou-pyou" or "kyoop-kyoop-kyoop". Full-grown juveniles emit "jeeer". Loud and ringing "cho! cho!" and "chowng-chowng" also mentioned.
Habitat. Wide variety of seasonal forests (wet and dry), from sea-level to 2600 m, usually in foothills; avoids interior of dense continuous forest. Recorded in clearings along rivers and at borders of dense secondary growth at fringes of cultivation (cocoa and banana plantations).
Food and Feeding. Diet includes various fruits, berries, also invertebrates, also occasional small lizard or frog. Forages in flocks of 3–8 individuals, at all levels of forest, also on ground; move through trees or on ground by long and agile hops. Normally keeps well hidden in foliage; not giving to flying over open spaces. Often attends trail of army ants (Formicidae) to feed on disturbed insects.
Breeding. Recorded between Jan and May. Possibly a social breeder. Nest bulky, of sticks and twigs, lined with finer twigs and plant fibres, built towards end of branch or in upright fork in small tree; one nest in isolated small tree was covered by creeping spiny palms. Clutch 3–5 eggs. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Relatively uncommon to locally common in Venezuela and Colombia; rather local in Panama and Costa Rica.
Bibliography. Blake & Vaurie (1962), Clements (2000), Dickinson (2003), Goodwin (1976), Haffer (1975), Hardy (1969a, 1984), Hilty (1977), Hilty & Brown (1986), Madge & Burn (1994), Meyer de Schauensee (1966, 1970), Meyer de Schauensee & Phelps (1978), Remsen *et al.* (2009), Restall *et al.* (2006), Ridgely & Tudor (1989), Sibley & Monroe (1990), Souza (2004), Stiles & Skutch (1989), Stotz *et al.* (1996), Van Perlo (2006).

30. White-tailed Jay

Cyanocorax mystacalis

French: Geai à moustaches **German**: Nacktwangen-Blaurabe **Spanish**: Chara Coliblanca

Taxonomy. *Pica mystacalis* de Sparre, 1835, Guayaquil, Ecuador.
Possibly closely related to *C. cayanus* or to *C. dickeyi*. Monotypic.
Distribution. SW Ecuador (Guayas, El Oro and W Loja) and NW Peru (S to W La Libertad).



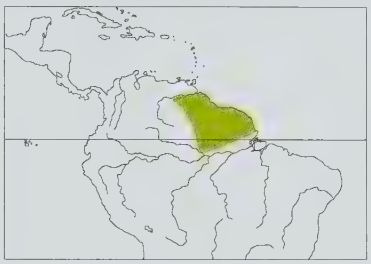
Descriptive notes. 33 cm; one male 160 g, one female 149 g. Feathers of forehead short-tufted and stiffly erect. Forehead, crown, side of head, side of neck, throat and upper breast are black (throat and upper breast of some individuals tend towards sepia), small white (sometimes blue-tinged) patch above eye, elongated white malar patch; nape, hindneck, upper mantle and lower side of neck white, rest of upperparts cyan-blue, sometimes tinged greyish; upperwing bright cyan-blue, inner margins of primaries blackish; tail white except for central feather pair, which bright cyan-blue with white tip; iris bright lemon-yellow; bill and legs black. Sexes similar. Juvenile has feathers of malar patch tipped and more or less suffused with purplish-blue, white spot above eye lacking until first moult, iris pale brown. Voice. Few vocalizations known. Typical is chatter call, which variable in pitch, and transcribed as "cha-cha-cha-cha" (possibly social call); another call is a double high-pitched "clewp-clewp".
Habitat. Inhabits several types of semi-humid forest to dry woodland, particularly thick growth near streams and rivers, from sea coast to 2600 m; in Loja (Ecuador) occurs in patches of semi-evergreen lower montane cloudforest. Associated particularly with mesquite woodland and shrubby cactus steppe. Recorded in cultivated areas with trees.
Food and Feeding. Beetles (Coleoptera), ants (Formicidae), other insects and seeds recorded in stomach contents of specimens. Pair reported as raiding nest of Pale-legged Hornero (*Furnarius leucopus*), having apparently excavated a hole in side of baked-mud structure in order to reach eggs. Forages in flocks up to ten individuals, also in pairs and singly, at all levels of forest, woodland or scrub areas; frequently on ground, more so than congeners, this perhaps due to its open or semi-open habitats. Seems to approach human settlements more frequently than do other jays; forages in gardens and eats eggs of domestic fowl and ducks.
Breeding. Adult carrying nest material in Feb–Mar. Probably solitary breeder. Nest said to be built in large tree adjacent to village. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Tumbesian Region EBA. Uncommon to locally fairly common. Appears to have declined; was considered fairly common in Loja Province of Ecuador, but now generally in low numbers there. Habitat destruction is reducing the amount of this species' typical habitats.
Bibliography. Best, Checker *et al.* (1996), Best, Clarke *et al.* (1993), Blake & Vaurie (1962), Clements (2000), Clements & Shany (2001), Dickinson (2003), Goodwin (1976), Haffer (1975), Hardy (1961, 1969a, 1984), Madge & Burn (1994), Meyer de Schauensee (1966, 1970), Parker & Remsen (1987), Remsen *et al.* (2009), Restall *et al.* (2006), Ridgely & Tudor (1989), Sibley & Monroe (1990), Stotz *et al.* (1996).

31. Cayenne Jay

Cyanocorax cayanus

French: Geai de Cayenne **German**: Cayenneblauhäher **Spanish**: Chara de Cayena

Taxonomy. *Corvus cayanus* Linnaeus, 1766, Cayenne, French Guiana.
Possibly closely related to *C. mystacalis*. Monotypic.
Distribution. SE Venezuela (N & E Bolívar and S Delta Amacuro), the Guianas, and N Brazil (Roraima S to Manaus area, and E to N Amapá).



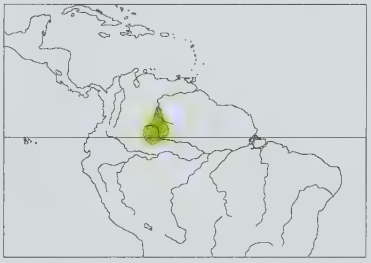
Descriptive notes. 33 cm; 147–230 g. An inconspicuous frontal crest with nasal tuft and forehead feathering stiffly erect but short. Has forehead, forecrown, side of head and side of neck black, posterior crown, nape and upper mantle white, slightly tinged blue; very small elongated white spot above eye and other below eye (on some individuals these spots bluish), white malar patch broader just below eye; upperparts from lower mantle light drab brown, somewhat tinged indigo-blue; upperwing pale indigo-blue, colour more intense on outer margins of primaries, inner margins dark brown; tail indigo-blue, all feathers with broad white tips (white area tends to increase slightly from central to outermost rectrices); throat and upper breast sepia, tending to black on some individuals, rest of underparts white or whitish-yellow; underwing with whitish coverts and blackish flight-feathers; iris pale blue to pale yellowish-white; bill and legs black. Sexes similar. Juvenile is duller than adult, with eye spots bluish and smaller (sometimes absent) and malar patch bluish (malar becomes white before eye spots do), also white of tailband suffused with violet-fawn, especially in centre. Voice. Repertoire quite varied. Clear downslurred whistle transcribed as "keyow" (possibly social call) and more sustained "jaaay!"(possibly social alarm call), given in sequence. Other calls transcribed as loud "choh-choh-choh", "perk-perk-perk", staccato "penk-penk", and metallic "ree". Short nasal buzzing note suggesting a trogon (Trogonidae) or a toucan (Ramphastidae), and other harsh notes, also reported.
Habitat. Woodland of various types, such as wooded savanna, riparian forest, and scrub on sandy soil, to 1100 m. Avoids interior of forest, recorded mostly at forest edge; enters gardens of settlements and even towns to feed at fruit trees. In Brazil, recorded at low-canopy forest (7–20 m) with understorey dominated by small-diameter trees, in vegetation called *campinarana* (adapted to poor soil types), and in shrubby vegetation with sparse trees, most of which less than 5 m tall (*campina*); recorded also in *terra firme* forest and disturbed vegetation.
Food and Feeding. Diet includes beetles (Coleoptera) and Orthoptera, and berries and fruits. Forages in canopy in small flocks; individuals tend to fly only short distances between branch perches, usually gliding and not flapping wings.
Breeding. Season apparently Dec–Mar. Communal breeder; usually one to three helpers. All members of one group participated in defence of nest. Large cup-shaped nest made of twigs, unlined, externally 23 cm high and 27 cm in diameter, placed 2–5 m above ground in tree, often an isolated one (e.g. mango tree on outskirts of a small native settlement). Clutch 4 eggs; nestlings seen to be fed by more than two individuals. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Fairly common to common but somewhat local in Venezuela and the Guianas; scarce in Brazil.
Bibliography. Blake & Vaurie (1962), Borges (1994, 2004), Bosque & Molina (2002), Clements (2000), Dickinson (2003), Goodwin (1976), Haffer (1975, 1992), Hardy (1961, 1969a, 1984), von Ihering & von Ihering (1907), Madge & Burn (1994), Meyer de Schauensee (1966, 1970), Meyer de Schauensee & Phelps (1978), Naka *et al.* (2006), Pelzeln (1868-71), Pinto (1944), Remsen *et al.* (2009), Restall *et al.* (2006), Ridgely & Tudor (1989), Robbins, Braun & Finch (2004), Robbins, Braun, Milansky *et al.* (2007), Ruschi (1979), Santos & da Silva (2007), Sibley & Monroe (1990), Sick (1985, 1997), Sigrist (2006), Souza (2004), Stotz *et al.* (1996).

32. Azure-naped Jay

Cyanocorax heilprini

French: Geai à calotte azur **German**: Fliederblaurabe **Spanish**: Chara Nuquiazul
Other common names: Heilprin's Jay

Taxonomy. *Cyanocorax heilprini* Gentry, 1885, Rio Negro, Brazil.
Monotypic.
Distribution. Extreme E Colombia (S Guainía and extreme E Vaupés, possibly also SE Vichada), extreme S Venezuela (W Amazonas) and extreme NW Brazil (upper R Negro).



Descriptive notes. 33–36 cm. Nasal tuft and forehead feathering stiffy erect but short, forming frontal crest. Forehead, forecrown and side of head black, side of neck, throat and upper breast sepia, narrow cyan-blue malar stripe; hindcrown, nape and hindneck sky-blue, washed white, upperparts bluish-mauve more or less suffused with brown-grey; upperwing greyish-horn, somewhat tinged blue on outer margins of primaries; tail greyish-horn, tinged blue, all feathers with narrow whitish tips (more conspicuous on underside); underparts below upper breast greyish-horn, heavily tinged blue, particularly on breast, paler on lower belly, becoming pale cream on undertail-coverts, underwing brownish; iris yellowish-white to golden-yellow; bill and legs black. Sexes similar. Juvenile not yet described. Voice. Loud, harsh "jeer", similar to that of *C. violaceus* but thinner, higher and more descending. Also nasal honking "duk-duk", a smooth and abrupt "keop", liquid "puk", rapid "je-je-je".
Habitat. Forest borders, secondary growth and savanna woodland, on sandy soils; recorded at 100–250 m. In Brazil found in *campinas* (shrubby vegetation with sparse trees, most of which less than 5 m tall) and *campinaranas* (low-canopy forest, 7–20 m, with understorey dominated by small-diameter trees).
Food and Feeding. No information available. Was found, supposedly while foraging, in small trees and bushes between forest edge and more lightly wooded savanna grassland.

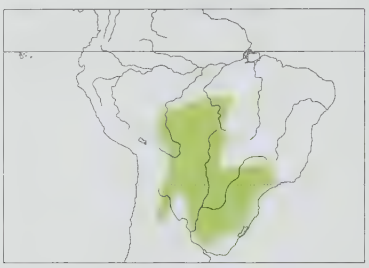
Breeding. Two juveniles noted in Mar and Apr in Venezuela. Nest described as basin-shaped structure of twigs, appearing carelessly made, placed 2–3 m above ground. No further information available.
Movements. Probably sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Orinoco-Negro White-sand Forest EBA. Very poorly known species. Appears to be very local and perhaps not uncommon.
Bibliography. Blake & Vaurie (1962), Borges (2004), Clements (2000), Dickinson (2003), Goodwin (1976), Haffer (1975), Hardy (1969a), Hilty & Brown (1986), von Ihering & von Ihering (1907), Madge & Burn (1994), Meyer de Schauensee (1966, 1970), Meyer de Schauensee & Phelps (1978), Olivares (1955), Pinto (1944), Remsen *et al.* (2009), Restall *et al.* (2006), Ridgely & Tudor (1989), Ruschi (1979), Sibley & Monroe (1990), Sick (1985, 1997), Sigrist (2006), Souza (2004), Stotz *et al.* (1996).

33. Plush-crested Jay

Cyanocorax chrysops

French: Geai acahé **German**: Kappenblaurabe **Spanish**: Chara Moñuda
Other common names: Plush-capped/Band-tailed/Urraca Jay

Taxonomy. *Pica chrysops* Vieillot, 1818, Paraguay.
Forms a species pair, and previously regarded as conspecific, with *C. cyanopogon*; it has also been suggested that the two form a superspecies with *C. dickeyi*. Proposed race *interpositus* (described from Alagoas, in NE Brazil) seems to be based on a female of *C. cyanopogon* in worn subadult plumage, but possibly a valid taxon. Four subspecies currently recognized.
Subspecies and Distribution.
C. c. diesingii Pelzeln, 1856 – N Brazil in extreme E Amazonas (right bank of lower R Madeira) and on S side of Amazon in W Pará (lower R Tapajós).
C. c. insperatus Pinto & Camargo, 1961 – W Pará (restricted to E lower R Tapajós, Serra do Cachimbo), in NC Brazil.
C. c. chrysops (Vieillot, 1818) – N, E & SE Bolivia (Beni, Cochabamba, Santa Cruz, Chuquisaca and Tarija), SE Brazil (Mato Grosso do Sul and São Paulo S to Rio Grande do Sul), Paraguay, NE Argentina (S to Chaco and Entre Ríos) and NW Uruguay.
C. c. tucumanus Cabanis, 1883 – NW Argentina (Salta, Tucumán, Catamarca and La Rioja).



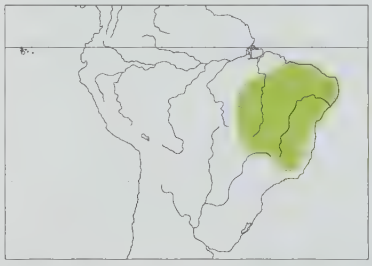
Descriptive notes. 32–35 cm; 127–170 g. Stiffened feathers on forehead become less stiff on forecrown and crown, with very velvety texture at tips, creating peculiar plush-like cap. Nominate race has forehead, crown and side of head black, rather elongated ultramarine spot over eye (washed white at upper edge), smaller spot of pure ultramarine-blue below rear eye, large cyan-blue malar stripe becoming quite broad in region just below eye; nape white, tinged ultramarine, hindneck pure ultramarine, upperparts indigo-blue; upperwing bright indigo-blue, inner margins of primaries brownish; tail bright indigo-blue with pale yellowish or white tips (tips 2·5 cm long on central feathers, 5 cm on outers); side of neck, throat and upper breast sepia; rest of underparts variable, from creamy to whitish, underwing brownish, except for creamy coverts, undertail brownish; iris bright lemon-yellow to pale yellow; bill and legs blackish. Sexes similar. Juvenile has nape pale bluish-mauve, but facial markings appear only at end of first month and similar to adult at second moult, browner iris becomes yellow before third month. Race *tucumanus* is similar to nominate, but larger; *diesingii* has more domed crown shape (longer feathers), smaller eye spots (larger spot not tinged white), smaller malar, paler nape and hindneck tending to lavender-blue, shorter whitish band at tail tip; *insperatus* is similar to last, but underparts and tail tips tend to be pure white. Voice. Large repertoire, 23 vocalizations identified, almost all consisting of melodic notes, with the exception of the harsh begging call of the juvenile. Louder vocalization (audible to 80 m), for territorial defence, and movements and gathering of flock, a single metallic and downward-inflected melodic note (social call). Social alarm call quite different, a single inflected note, this call part of a complex system of alarm calls which vary according to distance of predator; when predator far off alarm consists of single notes, when closer a sequence of 3–6 shorter notes. Five vocalizations related to contact, emitted mainly by foraging individuals; all comprise sequence of 2–6 very short notes, "chyup-chyup". Others vocalizations related to agonistic behaviour, carry very short distances. Repertoire includes imitations of other bird species, e.g. Collared Forest-falcon (*Micrastur semitorquatus*). Subsong (*sotto voce*) seems shorter and less frequently given than are those of congeners.
Habitat. Various types of forest, such as tropical lowland evergreen forest, tropical deciduous forest and temperate rainforest; usually from lowlands to 1500 m, but recorded at 2800 m in Bolivia. Common in patches of forest in open country, riparian forest, secondary forest and rural areas close to forest, especially where maize (*Zea mays*) plantations nearby; also in disturbed areas, such as eucalypt (*Eucalyptus*) plantations and suburban areas. Favours forest edge. In S Brazil found in *capões* (patches of southern temperate forest where the conifer *Araucaria angustifolia* dominates) in grassland areas. In Uruguay quite frequent in riparian forest. In Amazonia, race *diesingii* occurs in areas where forest broken by more or less isolated patches of dry forest (*cerrado*). It region of Pantanal, in SW Brazil, recorded in patches of forest and in riparian forest, although appears much less numerous than is *C. cyanomelas* in that ecosystem. Seems to live in drier areas in Paraguay and Bolivia: in Paraguay, recorded in *cerrado* and woodland *chaco*; in Bolivia, found in an area with the palm *Parajubaea torallyi* (Arecaceae) mixed with evergreen *Podocarpus* at 2300–2800 m, in another dry area with thorny forest at 1600–2500 m, and in another with *chiquitano* (xeric forest similar to *chaco*, but with stratification more like that of Amazonian forest).
Food and Feeding. In three study sites in S Brazil (Paraná), annual diet mainly small invertebrates (80% of records), mostly insects; also some fruits from 24 plant species (mostly *Casearia*, *Syagros*, *Psidium*, *Rapanea*, *Urera*, *Ficus* and *Phylodendrum*). Occasionally takes nestlings of small birds and frogs, and eats eggs of other bird species when it finds them; records of individuals eating dead snake. Also, regularly visits settlements for food scraps; maize an important food resource when available. During winter in S of range, when forest fruits not available, may exploit fruits from exotic plants such as *Diosporus kaki*. During autumn and winter in temperate forest of S Brazil, frequently eats seeds of *Araucaria angustifolia*; unlike *C. caeruleus*, takes these not only on tree but also on ground, where present as a result of foraging activity of other species, especially tufted capuchin monkey (*Cebus apella*); seems less dependent on *Araucaria* seeds than *C. caeruleus*. Seeds of *Araucaria angustifolia* and some other items, mainly animals, are not eaten where captured, but taken to another spot at least 5 m away, in the case of *Araucaria* seeds sometimes more than 60 m away. After examination, holds the food item with the feet and pecks and eats it piecemeal; in the case of large insects, such as Lepidoptera and Ortoptera, removes wings before swallowing item. Storing of food (e.g. seeds of *Araucaria*, maize, *Siagrus* nuts, dead animals) frequently observed, but recovering of items by same individual incompletely documented, although individuals seen to eat cached food. Caching sites on ground, when food covered with leaves, or in trees, between branches or epiphytes. Forages in flocks of 3–10 individuals in all forest strata, including ground, but canopy used less; in forest with dense understorey tends to forage less frequently on ground. Where co-exists with *C. caeruleus* it tends to forage in lower strata than latter, and at sites where it co-exists with *C. cyanomelas* or *C. cristatellus* forages more in areas with higher tree density. Exploits forest edge more than interior; commonly forages along edge or in riparian forest. Flock-members move singly across forest clearings and rivers; individuals usually fly short distances (less than 100 m) over open spaces. Hops along branches and flies for short distances, while pecking items or pursuing fleeing ones; sallying and flycathing sometimes used. Captures items on branches, leaves and epiphytes; on ground, removes and turns over dry leaves and twigs by sweeping bill sideways. Several records of this species in ant-following mixed flocks; in Paraguay, recorded in mixed flock with *C. cyanomelas* in dry forest.
Breeding. Breeds in Oct–Dec in Paraguay and S Brazil. Communal breeder; with two or three helpers; helpers assist with nest-building and mobbing of predators. Nest built with twigs, which form rounded external cup 28–34 cm across, inner cup lined with finer twigs and plant fibres, usually placed 4–7 m up in densely foliaged tree at middle level of forest; territory size 9–15 ha in S Brazil. Clutch 2–4 eggs; at five nests studied in S Brazil (Paraná), incubation period 18–20 days and nestling period 22–24 days; adults feed juveniles for 90 days after departure from nest.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Common to abundant in most parts of range. In Paraná state, in S Brazil, flocks had estimated home range of 20–30 ha. Has successfully expanded into urban areas of S & SE Brazil. Deforestation can lead to decrease in this species' numbers, but it may live in isolated forest fragments of 10–20 ha if not too far from larger forest fragments; among the bird species analysed in N Paraná, this species was considered to have one of lowest sensitivities to forest fragmentation.
Bibliography. Accordi & Barcellos (2006), Aleixo & Poletto (2007), Almeida *et al.* (1999), dos Anjos (2001a, 2001b, 2006), dos Anjos & Bóçon (1999), dos Anjos & Graf (1993), dos Anjos & Schuchmann (1997), dos Anjos & Uejima (1994), dos Anjos, Schuchmann & Berndt (1997), dos Anjos, Volpato *et al.* (2007), Antunes (2005), Azpiroz (2006), Barnett & Pearman (2001), Belton (1985), Blake & Vaurie (1962), Brooks *et al.* (2005), Brumfield *et al.* (2004), Clements (2000), Coles (1978), Cuello & Gerzenstein (1962), Dickinson (2003), Donatelli, da Costa & Ferreira (2004), Donatelli, Ferreira *et al.* (2007), Dubs (1992), Euler (1900), Flores *et al.* (2001), Goodwin (1976), Haffer (1975), Hardy (1961, 1969a, 1969b, 1984), Hayes (1995), von Ihering & von Ihering (1907), Krabbe *et al.* (1996), Krügel & dos Anjos (2000), Madge & Burn (1994), Malizia *et al.* (2005), Mercado (1985), Meyer de Schauensee (1966, 1970), Mitchell (1957), Narosky & Chebez (2002), Narosky & Yzurieta (2003), Novaes & Lima (1990), Pacheco & Olmos (2005), Pichorim & Bóçon (1996), Pinto (1944), Pinto & Camargo (1961), Piratelli & Blake (2006), Piratelli, Melo & Caliri (2001), Piratelli, Siqueira & Marcondes-Machado (2000), Remsen *et al.* (2009), Ridgely & Tudor (1989), Robbins *et al.* (1999), do Rosário (1996), Ruschi (1979), Scherer-Neto (1983), Scherer-Neto & Straube (1995), Scherer-Neto *et al.* (1994), Sibley & Monroe (1990), Sick (1985, 1986, 1997), Sigrist (2006), Snethlage (1914), Souza (2004), Stotz *et al.* (1996), Straube (1988, 1993), Tubelis & Tomás (1999, 2003), Uejima (1998), Willis (2003), Willis & Oniki (2003), Zyskowski *et al.* (2003).

34. White-naped Jay

Cyanocorax cyanopogon

French: Geai à nuque blanche **German**: Weißnacken-Blaurabe **Spanish**: Chara Nuquiblanca
Other common names: Blue-bearded Jay, White-collared Jay(!)

Taxonomy. *Corvus cyanopogon* Wied, 1821, Rio Cachoeira (a headwater of the River Ilhéos), eastern Bahia, Brazil.
Forms a species pair, and previously regarded as conspecific, with *C. chrysops*; it has also been suggested that the two form a superspecies with *C. dickeyi*. Proposed race *C. chrysops interpositus* (described from Alagoas, in NE Brazil) seems to be based on a female of present species in worn subadult plumage, but possibly a valid taxon. Monotypic.
Distribution. NE & E Brazil from Maranhão E to Ceará and Paraíba, S to SE Pará (upper R Xingú, Gorotire), extreme E Mato Grosso (R das Mortes), Goiás, Minas Gerais and Bahia, and isolated population in Espírito Santo.



Descriptive notes. 35 cm; 132–160 g. Feathers of forehead stiff, becoming softer and velvety in texture over crown and forming a soft, velvet-like, but not bulging cap. Forecrown and crown are black, side of head, side of neck, throat and breast sepia, small ultramarine-blue (heavily washed white) spot above eye, small pure ultramarine spot below rear eye, dark cyan-blue malar patch (hardly distinguishable from side of head); nape and hindneck white, hindneck slightly tinged blue on some individuals (those on upper R Xingu more heavily tinged blue), upperparts greyish-horn, upperwing dull dark brown, tail sepia with wide white at tips of all feathers (narrowest, but still broad, on central pair, widest on outermost); underparts below breast whitish, slightly tinged cream on some individuals; iris bright yellow; bill and legs blackish. Sexes similar. Juvenile has very small, dull eye spots and narrower and duller malar stripe than adult. Voice. Large repertoire seems very similar to that of *C. chrysops*, but not studied in detail. Most frequently heard call in the field a melodic and metallic "chyup-chyup". Includes imitations of other bird species, such as Yellow-headed Caracara (*Milvago chimachima*). Subsong (*sotto voce*) recorded in field, apparently more frequently given outside reproduction context than is the case with *C. chrysops*.
Habitat. Inhabits mostly dry scrub areas (*caatinga*) and dry forest (*cerrado*), at 400–1100 m. In a transect from *caatinga* to *cerrado* in NE Minas Gerais, however, this species was replaced by *C. cristatellus*; in another study, exhibited very high rates of relative abundance in two *caatinga* sites. Also, in SE Tocantins, present species had significantly lower abundance than *C. cristatellus* in *cerrado* sites. Commonly seen in riparian forest, secondary woodland, and at borders of tropical deciduous forest.
Food and Feeding. Poorly documented. Flying termites (Isoptera) and fruits of *Cereus jamacaru* recorded in NE Brazil. Seems regularly to visit plantations near human settlements.
Breeding. No documented details. One unconfirmed report from local people suggests that nest is poorly built, placed 3 m above ground, and that clutch contains up to 2 eggs.

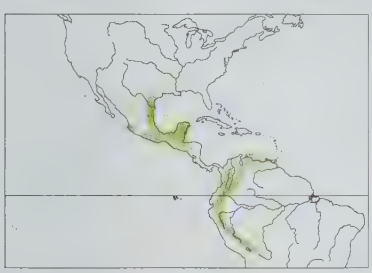
Movements. Sedentary.
Status and Conservation. Not globally threatened. Common over parts of its range. Evidence of some decline in Bahia state, perhaps a result of trapping for cagebird trade. Recent expansion into state of Espírito Santo evidently due to deforestation
Bibliography. de Araujo *et al.* (2006), Blamires *et al.* (2002), Braz & Cavalcanti (2001), Cavalcanti & Marini (1993), Clements (2000), Dickinson (2003), de Farias (2007), Goodwin (1976), Haffer (1975), Hardy (1961, 1969a, 1969b, 1984), von Ihering & von Ihering (1907), Kirwan *et al.* (2001), Madge & Burn (1994), Meyer de Schauensee (1966, 1970), do Nascimento (2003, 2004), do Nascimento *et al.* (2000), Olmos & Brito (2007), Pacheco & Olmos (2006), Parrini *et al.* (1999), Pinto (1944), Pinto & Camargo (1961), Remsen *et al.* (2009), Ridgely & Tudor (1989), Ruschi (1979), Santos (2004), Sibley & Monroe (1990), Sick (1985, 1986, 1997), Sigrist (2006), Souza (2004), Stotz *et al.* (1996), Willis (1992), Willis & Oniki (1991), Zenaide (1953).

35. Green Jay

Cyanocorax yncas

French: Geai vert **German**: Inkablaurabe **Spanish**: Chara Verde
Other common names: Inca Jay ("nominate group")

Taxonomy. *Corvus yncas* Boddaert, 1783, Chilpes, Junín, Peru.
Formerly placed in a monotypic genus, *Xanthoura*. Races fall into two groups, one in Central America (first eight listed below), known as the "*luxuosus* group", and the other in Andes of South America (remaining five races), known as "nominate group"; the groups are sometimes treated as two separate species. Race *luxuosus* intergrades with *vividus* in SE Sierra de Tuxtla and Catemaco region of S Veracruz. Proposed race *andicolus* (Andes of Mérida, Venezuela) subsumed into *cyanodorsalis*. Thirteen subspecies recognized.
Subspecies and Distribution.
C. y. glaucescens (Ridgway, 1900) – extreme S USA (S Texas) and NE Mexico (W Tamaulipas and Nuevo León).
C. y. luxuosus (Lesson, 1839) – extreme S USA (lower Rio Grande valley and SE corner of Texas) S through E & SC Mexico (S to Puebla and S Veracruz).
C. y. speciosus (Nelson, 1900) – Pacific slope of Mexico in Nayarit and Jalisco.
C. y. vividus (Ridgway, 1900) – Pacific slope of S Mexico (from Colima and Guerrero E to W Guatemala (Solola, in Patulul).
C. y. maya (van Rossem, 1934) – Tabasco and Yucatán Peninsula (except extreme S Quintana Roo), in E Mexico.
C. y. cozumelae (van Rossem, 1934) – Cozumel I (off NE Yucatán Peninsula).
C. y. centralis (van Rossem, 1934) – SE Mexico (extreme E Tabasco and adjacent parts of Chiapas E through extreme S Quintana Roo), N & E Guatemala, Belize and N Honduras.
C. y. confusus A. R. Phillips, 1966 – Pacific slope of S Chiapas (Mexico) and Guatemala.
C. y. galeatus (Ridgway, 1900) – subtropical zone of Colombia W of E Andes.
C. y. cyanodorsalis (A. J. C. Dubois, 1874) – C & E Colombia (subtropical zone of E Andes) and NW Venezuela (Zulia, and S Lara S to Táchira and Barinas).
C. y. guatimalensis (Bonaparte, 1850) – mountains of N Venezuela (Falcón E to Sucre and Anzoátegui.
C. y. yncas (Boddaert, 1783) – SW Colombia (subtropical zone, in valleys of upper Cauca, Patía, and San Miguel) S through E Ecuador and Peru to C Bolivia (La Paz and Cochabamba).
C. y. longirostris (Carriker, 1933) – arid upper valley of R Marañón, in N Peru.



Descriptive notes. 25–27 cm; 66–92 g. Short bushy frontal crest formed by tufted and stiffly erect nasal and frontal plumes. Nominate race has forehead and small rounded spot above eye ultramarine, large ultramarine malar patch ending at posterior region below eye; crown and nape pale yellow (whitish on some individuals), base of nape bluish (some birds have crown and nape heavily tinged blue); remainder of face black, reaching down onto black region of throat and upper breast; upperparts, including upperwing, shamrock-green, rump tinged sulphur-yellow on some individuals; tail dark green, outermost feather pair sulphur-yellow; underparts below breast sulphur-yellow, underwing brownish with sulphur-yellow base, undertail mostly blackish; iris brown to yellow; bill black; legs dull brownish-flesh. Sexes similar. Juvenile has shorter frontal tuft, and lacks spot above eye, acquires eye spot at first moult, after which much as adult; one individual had iris dull violet. Races differ mainly in plumage coloration and size, "*luxuosus* group" (Middle America) smaller than "nominate group" (Andes) and with short and inconspicuous frontal tuft and ultramarine crown and nape: *longirostris* is similar to nominate but larger, with iris yellow; *galeatus* has larger frontal crest and iris yellow; *cyanodorsalis* has larger frontal crest, short white band on front of crown, rest of crown and nape heavily tinged ultramarine, upperparts (back) tinged blue, iris yellow, legs brownish; *guatimalensis* is like previous, but crest shorter, less blue wash above, narrower white band on forecrown, legs grey; *luxuosus* has underparts yellowish, heavily washed lime-green, legs brown, iris yellow; *glaucescens* is overall paler than last, has tail tinged blue, legs blackish, iris dark brown; *centralis* has underparts sulphur-yellow, lighter than nominate, tinged lime-green (one individual was heavily washed lime-green, like *luxuosus*); *speciosus* has forecrown yellowish, and quite intense sulphur-yellow on underparts; *vividus* is similar to *luxuosus*, but larger, and yellow of underparts brighter, tail tinged blue; *confusus* is similar to previous, but smaller, and slightly darker above and, especially, on side of head; *maya* has underparts lighter sulphur-yellow; *cozumelae* is smallest race, with pale blue crown and bright yellow underparts. Voice. Very large vocal repertoire, not well described. Typical calls include metallic "cleeop" note and nasal "nyaa", which may be repeated faster several times, and a querulous 2-note call. Mewing, chattering, clicking, rattling, buzzing, squeaking and rasping notes also recorded. Mimicry common.
Habitat. Occupies variety of habitats, including tropical deciduous forest, humid forest edge, grassland with scattered tress, dense thickets along watercourses, open areas in interior of cloudforest, dry scrub areas and matorral; recorded also in marshland. Central America races typically inhabit drier areas at lower altitudes (sea-level to 2000 m in Mexico), such as subtropical forest of Rio Grande (Texas; mean annual rainfall 450 mm), in broadleaf forest and scrub at 100 m in Belize (1650 mm), and in evergreen forest dominated by ebony (*Pithecellobium flexicaule*) at 250 m in R Corona floodplain (900 mm mean annual rainfall). In South America primarily in montane forest (800–3000 m), but sometimes as low as 900 m (Pacific slope of Colombia) or down to sea-level in more humid areas. Can live in areas influenced by human impact, such as dense second-growth forest in lowlands, pine–oak (*Pinus–Quercus*) associations, pine and cypress plantations; also in canopy of trees 20–40 years old in shade coffee plantations and cacao plantations. Territories of four flocks studied in Colombia contained 5–70% grassland with scattered trees, 7–47% plantations of exotic trees (*Eucalyptus*, *Cupressus*, *Pinus*), and 10–15% secondary growth and meadow.
Food and Feeding. Diet of four groups studied in Colombia contained similar proportions of animal and plant matter (57% and 43%, respectively); in N races animal matter could account for larger proportion. In Colombia, feeds on beetles (Coleoptera), bugs (Hemiptera), grasshoppers and crickets (Orthoptera), eggs of lizards, and fruits of variety of plant species e.g. *Solanum*, *Rubus*, *Miconia*, *Palicourea*, *Clusia*, Myrtaceae, and Peruvian plum (*Spondias*), berries and probably fruits of other species; exploited several sources of food that became temporarily abundant, e.g. caterpillar of *Glena bisulca* (geometrid moth), earthworms, grubs, nymphs of beetles, and crickets in borders of recently ploughed fields (unavailable before being uncovered by plough). N races feed on beetles, bugs, grasshoppers and crickets, acorns (probably important when available) and fruits; said to show preference for acorns, and fruits of the palmetto palm. Small birds (nestlings and probably fledglings) also taken. Readily takes household scraps and other provided foods at feeders when not far from forest; reported as entering tents and houses; eggs of domestic fowl consumed when available. Food items rarely eaten immediately; instead, are carried in bill to a perch, where held with the feet, pecked apart and swallowed in small bits. Forages in small groups usually in subcanopy and in shrubby understorey, searching for food in all available strata, including ground, tree trunks and branches; rotten stubs of branches, lichens and bromeliads regularly exploited. Groups avoid clearings or other open spaces; flights across open spaces start from tallest available tree, rarely more than one individual at a time crossing open space. In Colombia all individuals in group forage within radius of less than 30 m, but, when moving onwards, some become isolated (35–40 m) from rest of group for a few minutes; observations showed that foraging jays distributed themselves along a wide front, instead of following each other along a narrow path. When searching for food on ground, removes and turns over dry leaves and twigs by sweeping bill sideways. On trees and shrubs usually proceeds from lower branches to top, and from trunk to tips of branches; hops along branches and pecks at any prospective food item, not infrequently stretching up to take an item from foliage directly overhead, or hanging down to reach branch immediately below. Often hangs upside-down in manner of a tit (Paridae) to explore foliage at tips of slender branches, or drops to ground to retrieve fallen items. Also seen to pursue insects in flight and to hover to take fruits and insects from small shrubs and ferns of understorey.
Breeding. Eggs recorded Apr–Jun in USA and Mar–Aug in Colombia. Two breeding systems recorded: co-operative breeding with more than two individuals (helpers) tending single nest (S races), and simple pair without helpers (N races). In both groups young stay in family flock for one year, but in N yearlings (which provide significant amount of territorial defence) are then driven from parental group; in S races, young do not disperse from parental group and all members of flock (both immatures and unmated adults) participate in nest-building and feeding of young, and at some nests helpers contribute more than half of food for nestlings (and often remain to guard nest when female absent); hypothesized that difference in breeding strategy due to more severe habitat saturation in Andean group (food less abundant, more patchily distributed, and with less seasonal variation than in Middle America), so that helpers should increase ultimate numbers of fledglings produced by being able to locate more food over a given time interval. Flocks (4–9 individuals) defend stable territories throughout year, average size 16·2 ha for Central American races (USA) and 43–87 ha for Andean ones (Colombia). Nest a shallow, loosely woven basket of slender twigs, inner cup containing fine roots, fine wiry twigs, vine stems, dried grass, pine needles, lichens and leaves, external diameter 23 cm and depth of inner cup 9 cm; placed usually in fork of twig close to trunk of tree or in bush, with various degrees of exposure, but usually not far from ground (1·5–10 m) in dense shrubbery. Clutch 3–5 eggs, commonly 4; incubation period thought to be 17–18 days; nestling period 19–22 days; fledglings fed for 3 weeks or longer after leaving nest, by both parents and, in S, by helpers. In S races, apparently does not breed until at least 2 years old.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Generally common to fairly common; often local. Very limited range in USA. Uncommon to locally common in Venezuela; common but very local in Colombia; fairly common in Ecuador and Peru.
Bibliography. Álvarez-Lopez (1975, 1983), Blake & Vaurie (1962), Brumfield & Maillard (2007), Clements (2000), Clements & Shany (2001), Collins (1972), Dickinson (2003), England (2000), García-Salas *et al.* (2001), Gayou (1986), Gehlbach *et al.* (1976), González-García (1993), Goodwin (1976), Hardy (1961, 1969a, 1984), Hellmayr (1934), Hennessey & Gomez (2003), Hennessey *et al.* (2003), Hilty (2003), Hilty & Brown (1986), Hornbuckle (1999), Howell & Webb (1995), Johnson & Jones (1993), Jones *et al.* (2002), Komar (1998), López-Lanús *et al.* (2000), MacLeod *et al.* (2005), Madge & Burn (1994), Meyer de Schauensee (1966, 1970), Meyer de Schauensee & Phelps (1978), Peterson & Navarro Sigüenza (2000, 2006), Peterson *et al.* (2003), Puebla-Olivares *et al.* (2002), Rappole & Blacklock (1985), Remsen *et al.* (2009), Restall *et al.* (2006), Ridgely & Greenfiled (2001), Ridgely & Tudor (1989), Salaman *et al.* (1999), Saunders & Edwards (2000), Schaldach *et al.* (1997), Sibley & Monroe (1990), Skutch (1987), Smith (1910), Stotz *et al.* (1996), Vallely & Whitman (1997), Van Perlo (2006), Verea & Solórzano (1998, 2001, 2005), Wetmore (1939), Winker *et al.* (1999), Zimmer (1953).


inches 5
cm 13
PLATE 32
ssp azurea
ssp pompata
36
37
ssp formosa
ssp morio
38
ssp vociferus
ssp atricapillus
ssp glandarius
39
ssp brandtii
40
ssp cervicalis
ssp krynicki
41
ssp hyrcanus
39
ssp leucotis
ssp taivanus
ssp japonicus
ssp canadensis
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ssp bispecularis
ssp interstinctus
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43
ssp obscurus
ssp yakutensis
42
ssp infaustus

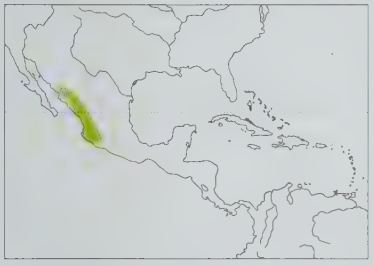
Genus *CALOCITTA* G. R. Gray, 1841

36. **Black-throated Magpie-jay**

Calocitta colliei

French: Geai à face noire **German**: Blauwangenhäher **Spanish**: Urraca Hermosa Carinegra
Other common names: Collie's Magpie-jay

Taxonomy. *Pica colliei* Vigors, 1829, San Blas, Nayarit, Mexico.
Genus sometimes subsumed in *Cyanocorax*. Forms a superspecies with *C. formosa*; often considered conspecific, and the two interbreed in Jalisco and Colima (birds with intermediate characters locally common). Monotypic.
Distribution. NW Mexico from S Sonora and SW Chihuahua S through Sinaloa to Jalisco and Colima.



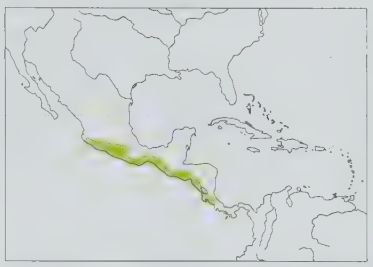
Descriptive notes. 58–77 cm; 225–251 g. Exceptionally long-tailed jay, long black feathers on forehead (almost 80 mm in length), sometimes tipped white or blue, form erect and slightly recurved crest. Crown, lores, side of head and side of neck are black, throat and breast sepia (throat may be partly or mostly white in N of range, S at least to Sinaloa); elongated white patch (washed cobalt-blue) above eye, sometimes connecting with sides of nape, and another below eye, large cobalt-blue malar patch, quite broad in region just below eye, bordered at base by narrow white band; nape and hindneck cobalt-blue, heavily washed white, on some individuals a narrow cobalt-blue band borders black area of side of neck and sepia area of breast; upperparts cobalt-blue, sometimes tinged grey; upperwing bright cobalt, outer margins of primaries cerulean-blue and inner margins brownish; very long tail graduated, two central feathers entirely bright cobalt-blue, outer feathers also cobalt but with wide whitish terminal band; underparts below breast white, somewhat tinged grey; underwing brownish, underwing-coverts white, underside of tail feathers brownish where blue above; iris dark brown; bill and legs black. Sexes similar, female with shorter tail than male. Juvenile has whitish throat and breast (but chin black), with sepia colour only on side of neck and in U-shaped collar enclosing breast, malar stripe and eye spots not so clearly defined as on adult, upperparts lighter and duller, tail shorter, and bill and legs paler; second-year has some white tips (as well as blue tips) on crown feathers. Voice. Quite rich repertoire, not studied in detail. Scolding call a short and repeated "keu-keu-keu". Among incredible variety of sounds that may be heard are harsh ("rrrrik" or "krrrrup" and "rroik"), whistled ("wheeoo") and "squeaking-gate" ("kyooh") notes, besides liquid, trilled and rattled ones, which sometimes combined. Each individual seems to emit large variety of sounds over short period. Raucous cries may resemble those of parrots (Psittacidae).
Habitat. Arid bushy country, thorn-forest, deciduous open woodland and riparian forest, from sea-level to 1800 m.
Food and Feeding. Feeds on invertebrates, berries and fruits. Forages at top of trees or in bushes, in more open areas; few other details. Forages in company of large passerines, such as Yellow-winged Cacique (*Cacicus melanicterus*).
Breeding. Eggs recorded in Apr. Social nester. Nest a very bulky structure of twigs, lined with mosses, lichens and roots, placed in thorny tree. Clutch 3–7 eggs. No other information.
Movements. Resident. Occasional records in C Sonora; one individual, presumed vagrant, reach extreme S of USA (Douglas, in Arizona).
Status and Conservation. Not globally threatened. Few data. Seems common to fairly common in its relatively small range. Forest fragmentation has had adverse effects locally on this species.
Bibliography. Blake & Vaurie (1962), Clements (2000), Dickinson (2003), García-Trejo & Navarro Sigüenza (2004), Goodwin (1976), Gordon & Ornelas (2000), Hardy (1961, 1969a, 1984), Howell & Webb (1995), MacGregor-Fors (2005), Madge & Burn (1994), Peterson & Navarro Sigüenza (2000), Remsen *et al.* (2009), Sibley & Monroe (1990), Stotz *et al.* (1996), Van Perlo (2006), Winterstein (1985).

37. **White-throated Magpie-jay**

Calocitta formosa

French: Geai à face blanche **German**: Langschwanzhäher **Spanish**: Urraca Hermosa Cariblanca

Taxonomy. *Pica formosa* Swainson, 1827, Temiscaltipec, Mexico.
Genus sometimes subsumed in *Cyanocorax*. Forms a superspecies with *C. colliei*; often considered conspecific, and the two interbreed in SW Mexico (Jalisco and Colima, where birds with intermediate characters locally common). A hybrid between present species and *Psilorhinus morio* recorded in S Mexico (Chiapas). Nominate race intergrades with *azurea* in Oaxaca (S Mexico). Three subspecies recognized.
Subspecies and Distribution.
C. f. formosa (Swainson, 1827) – S Mexico from Colima, Michoacán and Puebla S to Oaxaca.
C. f. azurea Nelson, 1897 – Pacific slope in SE Mexico (Oaxaca and Chiapas) and W Guatemala.
C. f. pompata Bangs, 1914 – SE Mexico (interior of E Oaxaca, interior of Chiapas) and Atlantic side of Guatemala (Motagua Valley) S through El Salvador and W Honduras to NW Costa Rica.
Descriptive notes. 43–56 cm; 205–213 g. Long-tailed jay with slightly recurved erectile forecrown crest of long black feathers (reaching 70 mm on some individuals) with whitish or bluish margins at base or, sometimes, reaching middle and almost all of feather. Male nominate race has crown and nape variable, black, or black with some feathers barred white and blue, or black just behind crest and sky-blue elsewhere; side of head, side of neck and throat to breast white (on some slightly washed bluish), sometimes white above eye forming supercilium (which begins at base of upper mandible); some dark feathers, sometimes bluish, around eye, and a blue-black malar stripe (often mottled) not reaching bill; sepia or blackish area bordering rear ear-coverts and extending as narrow U-shaped band across lower breast and frequently over base of hindneck; upperparts sky-blue, heavily tinged grey, rump slightly tinged green; upperwing bright sky-blue, inner margins of primaries brownish; long tail graduated, two central pairs of feathers entirely bright blue, other feathers blue only on basal



half and whitish elsewhere; underparts below breastband white, somewhat tinged grey; underwing-coverts white, contrasting somewhat with grey underside of flight-feathers; iris dark brown; bill and legs black. Female is like male, but has shorter tail, more extensive blackish on ear-coverts, narrower breastband, and upperparts slightly duller. Juvenile is similar to female, but central tail even less elongated, crown whiter, crest shorter and with feathers tipped blue and/or white, bill and legs greyer, upperparts duller greyish-blue, breastband narrower; much as adult after first moult, except that tail shorter. Race *azurae* is slightly larger than nominate, with crown and nape also variable but blue deeper, normally less black on face, female and juvenile more greyish on upperparts and wings, male brighter, tending to cobalt-blue, on upperparts and wings, no sepia on hindneck; *pompata* is smallest race, similar to previous, but upperparts and wings sky-blue with heavy grey tinge (as in nominate), side of head, throat and breast slightly washed blue. Voice. Quite rich repertoire, some vocalizations suggesting a large parrot (Psittacidae). Twelve vocalizations identified in one study, but variations of these quite common. Harsh downward-inflected "jeer!", and guttural "raah" or "reeah" when scolding. Other harsh notes include frog-like snore sound, squawking "schrrrr", and rolling or trilling downslurred "prrrreeeeeo". Melodic notes, sometimes described as liquid sounds, include clear inflected whistle, short snoring "clooo", "poop!", "weep-weep-weep", and piping note; also described are "kreeup", upslurred "reek", and loud "pee-ah", this last given by nesting female. Two vocalizations (termed "pump-handle" and "squeaky-gate" calls) sometimes combined in single vocalization, which is similar to those given by *Cyanocitta stelleri*. Subsong (*sotto voce*) recorded.
Habitat. Arid to semi-humid woodland, from lowlands to 800 m, reaching 1250 m in some localities. Inhabits areas of thorn-forest, deciduous forest and gallery forest, frequently visiting forest edges and bushy open country; regularly seen at borders of cultivation (coffee plantations). In C Mexico recorded, rarely, in columnar cacti forest. In most of range associated with more arid areas, but on Pacific side of S Chiapas and N Guatemala found in areas of heavier rainfall. In Central America, found in more arid habitats than those occupied by *Psilorhinus morio*. Also frequents larger clumps of trees and broken forest, especially along watercourses. In Costa Rica seems to prefer disturbed areas, being common in woodland and brushy cattle pasture; in Santa Rosa National Park, occurs in both woodland and pastures. In El Salvador considered an open-habitat generalist.
Food and Feeding. Reported items in diet are large invertebrates, small lizards, frogs, eggs and nestlings of small birds, also seeds, fruits, berries and grain (maize); nectar from large *Balsa* blossoms also consumed. In study in Costa Rica, this species spent more time foraging in woodland during wet season, when caterpillars (Lepidoptera) eaten in larger proportion than in dry season; during dry season consumed mostly fruits, particularly from acacia (*Acacia*) but also from *Curatella americana*, *Ficus*, *Spondias mombin*, *Byrsonima crassifolia* and *Muntingia calabura*; insects, including Orthoptera, and arachnids recorded in diet through the year. Fledglings in Costa Rica differed from adults in diet, taking relatively fewer arthropods and more fruits; young approach adult levels of foraging proficiency within one year. Forages in groups at all forest levels, including ground, where it moves in bouncing hops; investigates foliage, hanging tangles, leaf bases of bananas, and ground litter.
Breeding. Eggs recorded in Guatemala late Dec and early Jan in W and Jun and Jul on Caribbean slope, and mid-Apr in El Salvador; eggs in Feb–Jul and nest activity peaking in Mar–May in Costa Rica. Breeding system flexible, varying from single breeding pair within a given group range to multiple breeding pairs within a given group range, with partial range-sharing among related females; additionally, and unlike other American jays with helpers, has a male-biased natal dispersal, the groups consisting primarily of related matrilocal females which remain on natal territory as helpers, males dispersing from natal territory by 4–23 months of age to exist as floaters or join another group. Group-members assist with nest defence and the feeding of breeding female and her offspring; quantitative data from Costa Rica suggest higher proportion of food given by helpers when compared with other co-operatively breeding New World jays. In Costa Rica, territory size (10–31 ha) of 14 monitored groups (of 2–10 individuals) did not vary for three years, larger groups possessing larger territories containing more bull-horn (*Acacia*), a critical food resource during dry season; quantitative data suggests that group size and *Acacia* density are directly related to group breeding success. Detailed study in Santa Rosa National Park (Costa Rica) concluded that helpers increased breeding success by hastening onset of first laying, reducing predation on eggs and chicks, and decreasing hatching failure (presence of helpers did not affect incidence of clutch desertion or chick starvation). Bulky nest 12·7 cm in diameter, constructed by both sexes, made of large twigs, lined with rootlets, placed 6–30 m up in tree; in Guatemala (Colomba) one was placed in top of clump of tall bamboos growing beside stream and three others in shade tree of coffee plantation; in Costa Rica nests located in isolated trees in middle of pasture or near human dwellings, and suggested that sites chosen in order to avoid nest predation by monkeys. Clutch 2–6 eggs; incubation period unrecorded; nestling period 23 days.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Common resident in most of its geographical range. Common to fairly common in Mexico; common in Costa Rica.
Bibliography. Arizmendi & Espinosa (1996), Blake & Vaurie (1962), Clements (2000), Dickinson (2003), García-Trejo & Navarro Sigüenza (2004), Goodwin (1976), Gordon & Ornelas (2000), Hardy (1961, 1969a, 1984), Howell & Webb (1995), Innes & Johnston (1996), Komar (1998), Langen (1996a, 1996b, 1996c), Langen & Vehrencamp (1998, 1999), Madge & Burn (1994), Peterson *et al.* (2003), Pitelka *et al.* (1956), Remsen *et al.* (2009), Sibley & Monroe (1990), Skutch (1953, 1987), Stiles & Skutch (1989), Stotz *et al.* (1996), Van Perlo (2006).

Genus *PSILORHINUS* Rüppell, 1837

38. **Brown Jay**

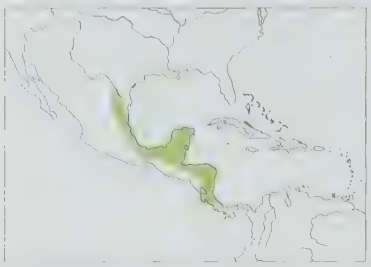
Psilorhinus morio

French: Geai enfumé **German**: Braunhäher **Spanish**: Chara Papán

On following pages: 39. Eurasian Jay (*Garrulus glandarius*); 40. Black-headed Jay (*Garrulus lanceolatus*); 41. Lidth's Jay (*Garrulus lidthi*); 42. Sichuan Jay (*Perisoreus internigrans*); 43. Siberian Jay (*Perisoreus infaustus*); 44. Grey Jay (*Perisoreus canadensis*).

Other common names: Plain-tipped/Plain-tailed Brown Jay (brown-tailed morph); White-tipped Brown Jay (white-tipped morph)

Taxonomy. *Pica morio* Wagler, 1829, Alvarado, Veracruz, Mexico.
Genus often subsumed in *Cyanocorax*. Occurs as two morphs, largely random in occurrence, white-tipped morph occurring at relatively high frequencies in arid and mesic regions, brown-tailed morph predominating in more humid areas; in Mexico, white-tipped morph, formerly treated as a separate species, "*C. mexicanus*", recorded N to C Veracruz (Plan del Río, 19°12' N), and brown-tailed morph found S to Montecristo, in Tabasco. Proposed race *cyanogenys* (described from Pearl Cay Lagoon, in Nicaragua) is synonymized with nominate. Three subspecies recognized.
Subspecies and Distribution.
P. m. palliatus van Rossem, 1934 – extreme S USA (lower Río Grande Valley, in extreme SE Texas), E Mexico (Nuevo León and Tamaulipas S to Veracruz, extreme E Tabasco and SW Campeche), S in Central America to W Panama (Almirante Bay region).
P. m. morio (Wagler, 1829) – SE Mexico from coastal plain of C Veracruz S to E Tabasco (Montecristo) and N Chiapas (Palenque).
P. m. vociferus (S. Cabot, 1843) – N Yucatán Peninsula.



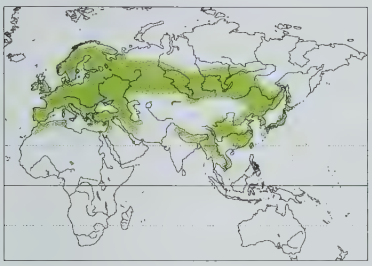
Descriptive notes. 38–44 cm; 173–224 g. Large jay with short bristly frontal crest somewhat inconspicuous, rather plush-like feathering on lores and around eye, highly graduated tail; small bare inflatable area on chest (the furcular sac), not visible unless calling. Nominate race has head sepia-coloured, small patch of black bare skin behind eye, and malar patch formed by different feather structure; upperparts, including upperwing and tail, dark brown, wing and tail with indistinct grey sheen in fresh plumage; tail plain (brown-tailed morph) or with white tips on all except central pair of rectrices (white-tipped morph); throat and breast dark brown, rest of underparts pale dull brownish-buff, becoming paler towards belly; iris dark brown, black orbital ring; bill and legs black. Sexes similar in plumage, female significantly smaller than male in all dimensions. Juvenile is a little paler than adult, with iris grey, narrow orbital ring and tiny bare eye patch yellowish (often becoming greenish soon after fledging), legs and bill yellow; ageing process individually variable, in general first-year has patchy yellow-and-black bill and legs, and bill may retain yellowish patches for several years. Race *palliatus* is larger than nominate, has underparts light drab, becoming pale towards belly; *vociferus* is paler overall than nominate, underparts paler buff, outermost tail feathers with whitish tips. Voice. Small repertoire. Most frequently heard is a loud "pay-ah" or "peer", with several variations in intonation, pitch and speed, delivered repeatedly by members of flock while moving; during mobbing (or when human present) becomes modified to a loud scream, higher-pitched and more strongly accented; "pay-ah" or variations of it given by nestlings and fledglings, also by female from nest during pre-laying period and throughout incubation (function unclear, but female more likely to call when flock-members present than when absent, suggesting that she vocalizes in order to attract attention). Sudden expansions of furcular pouch produce snapping and clicking sounds, these sometimes combined with "pay-ah". In aggressive situations, as during inter-group encounters at territory borders, harsh churring notes. Juvenile gives "hew" note, also calls as do older birds but more softly and at higher pitch.
Habitat. Mosaic of habitats, from coastal areas to 2500 m, with notable preference for disturbed areas (edges of plantations) over undisturbed ones; avoids interior of forest. In long-term study in Monteverde (Costa Rica), flocks occupied woodlots and ravines with remnants of lower montane moist/wet forest and with open pastures, cultivated bananas and coffee. In Tamaulipas and San Luis Potosí (Mexico) recorded along river in climax evergreen forest and in border of tropical deciduous forest. In E Honduras and N Nicaragua (region known as Moskitia), recorded in varied habitats ranging from forest (mature and young) to open areas (e.g. coastal regions and mangroves). Recorded in a reserve with thorn-forest, a vegetation type endemic in Mexico, dominated by tinto tree (*Haematoxylon campechianum*).
Food and Feeding. Takes insects, spiders (Araneae), lizards, nectar of banana and balsa flowers, and fruits, especially those of *Castilloa elastica*, *Passiflora* and catkin-like fruits of *Cecropia*; also takes nestlings of smaller birds. Forages in flocks of 5–24 individuals (average 10), usually with adults, young and immatures, which maintain overlapping home ranges of 10–20 ha; new flocks probably formed by splitting of very large flocks and, in some cases, by fusion of individuals from separate neighbouring flocks. Flocks known to occupy same home range for long periods (5 years). Foraging activity begins after "rallying" behaviour (a seemingly spontaneous burst of calling and rapid flight through canopy, starting half an hour before sunrise); as day progresses, flock tends to forage in lower vegetation strata. Gleans foliage for insects, probes rotten wood or under loose bark; occasionally flies out to catch insects on the wing. Less than 10% of daily activity spent on the ground, and then only for capturing food item. During foraging, adults normally quiet, but juvenile may call loudly while moving through canopy. Three records of following ant swarms (Formicidae) out of total of 17 separate army-ant swarms observed in subtropical forests of Cordillera de Tilarán at Monteverde, in Costa Rica.
Breeding. Eggs recorded in Mar–Jun, with peak in Apr. Social nester, but breeding behaviour varies more than in other co-operatively breeding New World jays, from one or more nests with helpers (young, non-breeding birds) in same territory to true communal breeding; such variation possibly due to both availability of suitable habitats and density of individuals. Groups contain 3–17 individuals during breeding season. In Monteverde (Costa Rica), group-members collaborate in nest-building, feeding of incubating female, and feeding and defending of nestlings and fledglings, 29% of groups contain two or three breeding females with separate nests but successful reproduction normally limited a single female per group. Aggressive behaviour (aerial chasing and harsh calls) common in territorial encounters between flocks, can last from 10 minutes to 3 hours, accompanied by fighting (pecking and foot-grappling) in 31% of observed encounters, but non-aggressive behaviour also seen in 27% of encounters (some between individuals of different flocks). Nest a very bulky mass of large twigs and vines, lined with fibrous roots, usually placed 8–12 m above ground in isolated tree (e.g. *Ficus tuerckheimii*, *Croton gossypifolius*, *Inga tonduzzii*) well away from woods, but protected from wind, less often 3–6 m up in crown of banana plant; nests in isolated trees in pastures produced more fledglings than did nests located along windbreaks or in forest, because latter more exposed to predation. Clutch 2–8 eggs, larger clutches the product of more than one female; incubation period 18–20 days; nestling period c. 22–18 days; fledgling period 22–31 days, young birds protected by older flock-members for up to a year after fledging; in contrast to most other corvids, dispersal male-biased within the population and occurs mostly at 2–3 years of age, almost always to an adjacent territory, and in new groups males and females must often wait several years before breeding; individuals of both sexes older than 4 years more likely to become breeders. Success variable; small groups in Monteverde more likely than large groups to have total reproductive failure in a season; one study revealed, however, that success seems related to number of old birds instead of simply flock size. Survivorship of adults high, annual survival 86%.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Common in most of its range. Recently reported from El Salvador. Has benefited from forest fragmentation, which has created more open areas; this species has expanded in Costa Rica, spreading into Pacific lowlands, and in Panama.
Bibliography. Anderson *et al.* (2004), Blake, E.R. & Vaurie (1962), Blake, J.G. & Loiselle (2001), Clements (2000), Dickinson (2003), England (2000), González-García (1993), Goodwin (1976), Haemig (1989a), Hale *et al.* (2003), Hardy (1961, 1969a 1984), Howell & Webb (1995), Komar (1998), Lawton & Guindon (1981), Lawton & Lawton (1980, 1985), Madge & Burn (1994), Morrison & Slack (1977), Ortiz-Pulido *et al.* (1995), Peterson *et al.* (2003), Piaskowski *et al.* (2006), Puebla-Olivares *et al.* (2002), Remsen *et al.* (2009), Rojas Soto *et al.* (2001), Santiago-Alarcón (2003), Selander (1959), Sibley & Monroe (1990), Skutch (1960, 1987), Stiles & Skutch (1989), Stotz *et al.* (1996), Sutton & Gilbert (1942), Vallely (2001), Van Perlo (2006), Williams, D.A. (2000, 2004), Williams, D.A. & Hale (2006), Williams, D.A. *et al.* (1994).

Genus *GARRULUS* Brisson, 1760

39. Eurasian Jay
Garrulus glandarius

French: Geai des chênes **German**: Eichelhäher **Spanish**: Arrendajo Euroasiático
Other common names: Common/European/Acorn/White-eared Jay; Black-crowned Jay ("*cervicalis* group"); Black-capped Jay ("*atricapillus* group"); Iranian Jay (*hyrcanus*); Brandt's Jay ("*brandtii* group"); Japanese Jay ("*japonicus* group"); Himalayan/Red-crowned Jay ("*bispecularis* group"); White-faced Jay ("*leucotis* group")

Taxonomy. *Corvus Glandarius* Linnaeus, 1758, Sweden.
Geographical variation complex, races divided into eight groups: European "nominate group" (first eleven races listed below), N African "*cervicalis* group" (*whitakeri*, *minor*, *cervicalis*), Middle Eastern "*atricapillus* group" (*samios*, *anatoliae*, *iphigenia*, *krynicki*, *atricapillus*), "Caspian group" (*hyrcanus*), Siberian "*brandtii* group" (*brandtii*, *kansuensis*, *pekingensis*), "*japonicus* group" (*japonicus*, *tokugawae*, *hiugaensis*, *orii*), Chinese "*bispecularis* group" (*sinensis*, *taivanus*, *bispecularis*, *interstinctus*, *oatesi*), and Indochinese "*leucotis* group" (*haringtoni*, *leucotis*). DNA research into relationships among these groups has so far been limited, but revealed only minor differences of little significance. Numerous additional forms have been described, all of doubtful validity, the majority referable to intermediate populations, and these are best treated as synonyms of recognized races: thus, *armoricanus* and *caledoniensis* are synonyms of *rufitergum*, *septentrionalis* of nominate, *lusitanicus* of *fasciatus*, and *yugoslavicus* and *jordansi* of *albipectus*; *oenops* and *theresae* are synonyms of *minor*; *rhodius*, *zervasi*, *chiou*, *susianae* and *hansguentheri* are synonyms of *anatoliae*, and *nigifrons* of *krynicki*; *caspius* is a synonym of *hyrcanus*; *sewerzowii*, *bambergi*, *pallidifrons*, *kurilensis* and *ussuriensis* are synonyms of *brandtii*, and *diaphorus* is a synonym of *pekingensis*; *namiyei* is a synonym of *japonicus*, and *schimoizumii* of *hiugaensis*; and *insularis* is a synonym of *taivana*, *persaturatus* and *azureitinctus* are synonyms of *interstinctus*, and *rufescens*, *rubrosus* and *minhoensis* are synonyms of *sinensis*. Thirty-four subspecies currently recognized.
Subspecies and Distribution.
G. g. hibernicus Witherby & E. J. O. Hartert, 1911 – Ireland.
G. g. rufitergum E. J. O. Hartert, 1903 – C & S Scotland, England, Wales and NW France.
G. g. glandarius (Linnaeus, 1758) – N & C Europe E to Urals.
G. g. fasciatus (A. E. Brehm, 1857) – Spain and Portugal.
G. g. corsicanus Laubmann, 1912 – Corsica.
G. g. ichnusae O. Kleinschmidt, 1903 – Sardinia.
G. g. albipectus O. Kleinschmidt, 1920 – Italy, Sicily and Dalmatian coast.
G. g. graecus Keve-Kleiner, 1939 – W Balkans, including mainland Greece.
G. g. ferdinandi Keve-Kleiner, 1943 – E Bulgaria and adjacent N Thrace.
G. g. cretorum R. Meinertzhagen, 1920 – Crete.
G. g. glaszneri Madarász, 1902 – Cyprus.
G. g. whitakeri E. J. O. Hartert, 1903 – N Morocco and NW Algeria.
G. g. minor J. Verreaux, 1857 – C Morocco and Saharan Atlas range of Algeria.
G. g. cervicalis Bonaparte, 1853 – N & NE Algeria and Tunisia.
G. g. samios Keve-Kleiner, 1939 – Samos and possibly Kos (Greece), in SE Aegean Sea.
G. g. anatoliae Seebohm, 1883 – W, C & E Turkey E to N Iraq and W Iran.
G. g. iphigenia Sushkin & Ptuschenko, 1914 – Crimea.
G. g. krynicki Kaleniczenko, 1839 – Caucasus & NE Turkey.
G. g. atricapillus I. Geoffroy Saint-Hilaire, 1832 – W Syria, W Jordan and adjacent part of Israel.
G. g. hyrcanus Blanford, 1873 – S Caspian forests of SE Azerbaijan and N Iran.
G. g. brandtii Eversmann, 1842 – S Siberia from Urals E to Sakhalin I, S to N Mongolia, NW & NE China, Korea and N Japan (Hokkaido).
G. g. kansuensis Stresemann, 1928 – C China (Qinghai, Gansu and NW Sichuan).
G. g. pekingensis Reichenow, 1905 – E China (S Liaoning, Beijing Shanxi, Hebei).
G. g. japonicus Temminck & Schlegel, 1847 – C Japan (Honshu and Oshima).
G. g. tokugawae Takatsukasa, 1931 – Sado I (off Honshu).
G. g. hiugaensis Momiyama, 1927 – Kyushu (SC Japan).
G. g. orii Nagamichi Kuroda, 1923 – Yakushima (S Japan).
G. g. sinensis Swinhoe, 1871 – SC, S & E China and N Myanmar.
G. g. taivanus Gould, 1863 – Taiwan.
G. g. bispecularis Vigors, 1831 – W Himalayas E to W Nepal.
G. g. interstinctus E. J. O. Hartert, 1918 – E Himalayas, S Assam and SE Xizang.
G. g. oatesi Sharpe, 1896 – NW Myanmar.
G. g. haringtoni Rippon, 1905 – W Myanmar.
G. g. leucotis Hume, 1874 – C & E Myanmar, S China (S Yunnan), Thailand and C & S Indochina.
Descriptive notes. 32–36 cm; 150–190 g. Distinctive, rather broad-winged woodland bird with hesitant, shallow-flapping wing action; small to medium-sized bill, nostrils just concealed by soft nasal tuft, slightly elongated crown feathers which can be elevated into short, ruffled crest, medium-length tail with squared tip; plumage pinkish-grey or reddish-brown with wholly black tail and contrasting white rump. Nominate race has forehead and crown, lores and area around eye whitish, crown streaked black, nasal tuft whitish or buff; chin and throat whitish, bold black malar stripe; rear crown, side of head and most of body plumage light to medium pinkish-brown to



reddish-brown, vent and both uppertail-coverts and undertail-coverts white; tail black, becoming greyer towards base; upperwing pattern complex, but essentially lesser and median coverts rufous, primary coverts and outer greater coverts bright blue with fine black barring, inner greater coverts black, primaries greyish-black with narrow whitish edges on outer webs, secondaries blackish with white bases on outermost five feathers, innermost tertial chestnut with black tip; iris bluish-white; bill brownish-horn; legs flesh-brown. Sexes similar. Juvenile is similar to adult, but body darker reddish-brown, legs brighter fleshy-yellow, iris more bluish and bill greyer; much as adult by first autumn, but with more irregular black barring on blue wing patch. Races differ mainly in tone of body plumage, and in crown and wing patterns, also in size: *rufitergum* is more reddish, less grey, than nominate; *hibernicus* is even redder brown, especially below; *fasciatus* is much greyer and has bolder crown streaks; *ichnusae* is smaller and redder above than previous, and has finer crown streaks; *corsicanus* is close to nominate, but richer vinous above and below; *albipectus* is paler above and below than nominate, and has more extensive white on belly; *graecus* is similar to last, but has less white on belly; *ferdinandi* is pinker, less grey, overall; *cretorum* has even less, or no, white on belly; *glaszneri* is rather dark dull brownish, with rufous forehead and weak bill; in N Africa, *cervicalis* has whitish sides of head and neck, two-toned upperpart coloration, and solidly black cap, *whitakeri* has cap broadly streaked and less extensive white on head, and *minor* is smaller and darker, with pinkish side of head and boldly streaked crown; in Middle East, *atricapillus* has solidly black rear crown (like *cervicalis* of N Africa), extensive white forecrown, uniform upperpart coloration, and dark iris, *anatoliae* is darker than last and with white of face and forecrown washed vinous, *samios* also is dark and has vinous and reddish-brown feathering mixed on underparts, *krynicki* is darker, with pale areas of face and forecrown washed vinous-pink, and *iphigenia* is paler and greyer than last, with whiter forecrown and face; *hyrcanus* is rather small, dark vinous-pink in overall tone, with shorter crown feathers than others, and black cap extends onto forehead but rear crown mottled; in Siberian group, *brandtii* has dark iris, dusky nasal tuft and blackish lores, bright rufous head and neck contrasting with grey upperparts, *kansuensis* has less black on face, is less grey than previous and has less white in secondaries, *pekingensis* is a variable form, close to *leucotis* but with white secondary patch; in Japanese group, *japonicus* is quite large, has pale eyes, dusky face, blackish but streaked crown and a large white secondary patch, *tokugawae* is larger and paler, *hiugaensis* is darker and has brownish rear crown, and *orii* has less white in wings and is darkest of group; in Chinese group, *bispecularis* is dark-eyed, lacks white wing patch, has only weak-streaked or unmarked crown and (apart from black malar stripe) uniformly pinky-rufous head and body colour, *interstinctus* is darker, more reddish-brown, above, *sinensis* is vinous-toned on body and with grey wash above, *taivanus* is smaller and weaker-billed than last and has paler underparts and black nasal tufts, and *oatesi* has very pale face, weakly marked crown and pinkish-brown crown and body; in Indochinese group, *leucotis* lacks white secondary patch, has dark eyes and whitish side of head and is darker overall, with most of crown black, and *haringtoni* is similar but paler, and has crown weakly streaked. Voice. By far the most familiar call is a loud, dry, rasping screech, "shaaaaak", often repeated when individual alarmed. Apart from this, has wide vocabulary of subdued notes, which based on mimicry. These notes generally worked into subdued warbling song, the most obvious mimicry being of the mewing of Common Buzzard (*Buteo buteo*); this song easily overlooked in the wild, but well documented for captives.

Habitat. Inhabits woodlands and forests of all kinds, especially beech (*Fagus*) and hornbeam (*Carpinus*), although oak (*Quercus*) preferred. N populations occur also in conifers and birch (*Betula*) forest. Found also in parks, orchards and large gardens. Only rarely seen in open country, even then chiefly during sporadic irruptive movements. From lowlands to 4000 m.

Food and Feeding. Omnivorous. Chiefly invertebrates during breeding season, notably caterpillars and beetles (Coleoptera) gleaned from foliage of trees; diet also includes eggs and nestlings of a range of birds up to size of a sparrowhawk (*Accipiter*); wide variety of seeds and berries eaten, especially in autumn and winter, including grain, beech mast, chestnuts and acorns; in Siberian taiga feeds mainly on pine (*Pinus*) seeds. Although not a carrion-eater it seems to be an opportunist, having taken to visiting garden birdtables in recent decades in areas where unmolested, even attempting to cling to suspended bags of peanuts. One reported as pausing to dip down to pick a small live fish from surface of a river as it flew across; perhaps even more remarkably, one was seen to take bats from a tree hole. Throughout autumn and into winter builds up caches of acorns, burying them individually in leaf litter on forest floor or beneath clumps of brambles or ferns, and has been estimated that a single jay could store c. 3000 acorns in one month, making this species one of the most prolific planters of oaks; by following summer many acorns will have germinated, and the jay has learnt that a germinating seedling is attached to an acorn and will select these while foraging in summer. Normally extremely shy and wary, keeping very much to cover of dense foliage, although in city parks can become remarkably confiding. Typically solitary, and rarely found in numbers greater than a family group, but small gatherings of unmated birds form in spring, with much posturing to attract a mate, and quite large communal roosts sometimes develop in late summer and autumn (seem to be of a temporary nature, and possibly associated with eruptive activity). Normally utilizes lowest airspace, flying between trees with hesitant action; during sporadic eruptive movements, however, flocks form and unite, sometimes several hundreds together, climb high and move out with steadier wing action. Observed with foraging flocks of White-crested Laughthrushes (*Garrulax leucolophus*) in Thailand.

Breeding. Laying mainly from mid-Apr in most of Europe, towards end of Apr in N and a week or so earlier in S; in Israel from as early as late Feb, and primarily in Mar in N India. Long-term, probably lifelong, pair-bond. Solitary nester. Nest built by both sexes, well constructed, a platform of twigs around a relatively deep cup, lined with soft plant materials; placed 4–6 m above ground and often at junction of substantial branch and main trunk, rarely in tree cavity, well concealed by foliage, typically near tree centre or lower crown; sometimes in large nestbox or on old building. Clutch 3–10 eggs, chiefly 5–7; incubation by female only, period 16–19 days (mainly 16–17 days); chicks fed by both parents, nestling period c. 19–23 days, mostly 21–22 days; young independent of parents at c. 7–8 weeks, when parents can become aggressive towards them. First breeding at 2 years of age, sometimes even at 1 year.

Movements. Mainly resident, with irregular movements, including irruptions and seasonal altitudinal movements. Almost all (98%) recoveries of British-ringed individuals are within 50 km of ringing site. S races often altitudinal migrants in montane regions, making post-breeding descent to lower elevations. In some autumns, when the acorn crop fails, those in Scandinavia form huge flocks and travel towards SW, recent notable years in this respect being 1955, 1977 and 1983; examples of the numbers involved include 34,000 which moved through at a count point near St Petersburg (Russia) in 1975, and some 35,000 flew over Gdansk (Poland) during a four-week period (mid-Sept to mid-Oct) in 1964; one of the most striking was in 1983, when 10,000 moved through S Sweden in late Sept prior to the biggest invasion ever in Britain, culminating in 6000 in one day over Cornwall. Such movements occur also farther E, but are less well documented; movements are regular in SE Russia (Ussuriland) and in the N Altai ranges of C Asia.

Status and Conservation. Not globally threatened. Common to locally abundant. The following estimates (territories/pairs) have been made for most countries within W Palearctic: Britain 160,000, Ireland 10,000, France 100,000–1,000,000, Belgium 22,000, Luxembourg 15,000–20,000, Netherlands 30,000–60,000, Germany 440,000–560,000, Denmark 15,000–160,000, Norway 10,000–100,000, Sweden 200,000–500,000, Finland 100,000–150,000, Estonia 30,000–50,000, Latvia 20,000–40,000, Czech Republic 150,000–300,000, Slovakia 15,000–30,000, Hungary 60,000–100,000, Austria 25,000–40,000, Switzerland 35,000–50,000, Italy 50,000–200,000, Spain 540,000–1,100,000, Portugal 10,000–100,000, Greece 20,000–50,000, Albania 5000–10,000, Croatia 150,000–200,000, Slovenia 20,000–30,000, Bulgaria 1,000,000–5,000,000, Romania 350,000–500,000, Russia 1,000,000–10,000,000, Belarus 220,000–250,000, Ukraine 55,000–60,000, Moldova 35,000–50,000, Azerbaijan 1500+, Turkey 100,000–1,000,000. In addition, it is said to be common in Lithuania, fairly numerous in Poland, common in Cyprus, locally common in suitable habitats in Jordan and Israel; in Morocco and Algeria widespread but localized in N, and in Tunisia uncommon. Densities vary considerably, 0·3–5·5 pairs/10 ha in SE Poland, 5 pairs/10 ha in Hungary, and in prime forest in Switzerland as many as 12 pairs/10 ha. In early 20th century, this species' colourful blue wing feathers became very fashionable, both as a hat decoration and in the making of "flies" for salmon-fishing. Long persecuted by gamekeepers and farmers owing to its egg-stealing and nest-robbing habits, but reduction in keepering intensity since 1920s has allowed a steady increase, which accelerated in 1950s as the creation of larger suburban gardens and city and town parks provided habitats safer from human persecution. Over much of its European range is now increasing; surprisingly, the Irish population contracted considerably between 1970s and 1990s, reasons for which uncertain. Farther E, it is thinly distributed across Siberia, but becomes more numerous in China and Japan; farthest S in range, in Himalayan regions and elsewhere in SE Asia, locally numerous but by no means common.

Bibliography. Akimova *et al.* (2007), Ali & Ripley (1972, 1987b), Andren (1990), Austin & Kuroda (1953), Bannerman (1954), Brazil (1991), Chen Fuguan *et al.* (1998), Chettleburgh (1952, 1955), Coombs (1978), Cramp & Perrins (1994), Dearborn & Gager (2009), Dementiev *et al.* (1954, 1970), Goodwin (1951, 1956, 1986), Grimmett *et al.* (1998), Haffer (1993a), Hagemeijer & Blair (1997), Haraszthy (1984), Hartert (1903), Holyoak (1967, 1968, 1971), John & Roskell (1985), Keve (2005), Koskimes (1989), Madge & Burn (1994), Mal'chevski & Pukinski (1983), Nechaev (1991), Rasmussen & Anderton (2005b), Roberts (1992), Roselaar (1995), Schifferli *et al.* (1980), Snow & Perrins (1998), Stepanyan (1990, 2003), Tomek (2002), Tomialojc (1990), Tureck & Kelso (1968), Vaurie (1954, 1959), Voous (1954), Walasz & Mielczarek (1982).

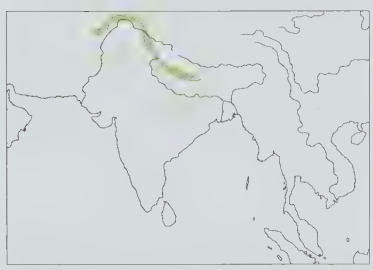
40. Black-headed Jay

Garrulus lanceolatus

French: Geai lancéolé **German**: Strichelhäher **Spanish**: Arrendajo Cabecinegro
Other common names: Black-throated(!)/Lanceolated Jay

Taxonomy. *Garrulus lanceolatus* Vigors, 1831, Simla–Almora district, north India.
This species and *G. lidthi* sometimes placed together in a separate genus, *Lalocitta*. Monotypic.

Distribution. E Afghanistan (mountains near Kabul and Paktia) and W Himalayas across N Pakistan (S to Safed Koh range) and Kashmir (absent from the Vale) E to Nepal (E to vicinity of Kathmandu).



Descriptive notes. 33 cm; 84–104 g. Unmistakable, with black hood, elongated crown feathers erectable into ruffled crest, greyish-pink body and relatively long, barred blue tail; bill small, rather stout. Almost entire head is black, chin and throat streaked white on black background, side of neck, hindneck and most of body plumage pinkish-grey, with grey tones highlighted when viewed in dull light; underparts, especially belly and undertail-coverts, pinker than greyer upperparts; tail blue, closely barred with black, wider but still narrow black subterminal bar highlighting white tips of all feathers; upperwing pattern complex, in essence lesser and median coverts black, primary coverts white, outer secondaries blue and narrowly barred black, with wider black subterminal bar and white tip, tertials light grey with black subterminal bar and white tip, primaries dark grey, outer webs marbled bluish and narrowly edged whitish; iris reddish-brown to dark brown; bill pale olive-grey to pale horn; legs bluish-grey. Sexes similar. Juvenile is duller and browner overall than adult, lacks white tips on wing feathers, has greyish tips on duller tail feathers, crest shorter than that of adult; after autumn moult, head and body like adult, but most of juvenile wing and tail feathers retained. Voice. Similar to that of *G. glandarius*. Typical call a dry rasping "skaaaak", somewhat thinner than that of *G. glandarius* and usually uttered only singly; rather flat "krah" given more frequently than by *G. glandarius*, and mewing call similar to latter's but higher in pitch. Subdued song of mixed bubbling, whistling and mewing notes interspersed with mimicry recorded in captivity; quiet nature of song renders it almost inaudible in the wild.

Habitat. Forests, preferring mixed pine–oak (*Pinus–Quercus*) and cedar–oak (*Cedrus–Quercus*) woodlands. Shows distinct preference for more open forest than that used by *G. glandarius*, the latter preferring to be concealed amid dense foliage. Freely found on shrubby hill slopes and degraded forest; including edges of clearings and villages. Breeds between 1500 m and 4000 m, descending a little lower in winter.

Food and Feeding. Omnivorous. Chiefly invertebrates during breeding season, also small lizards and the eggs and nestlings of small birds; diet includes variety of seeds and berries, especially in autumn and winter, including pine seeds. Scavenges discarded household food scraps around villages. Like *G. glandarius* is very fond of acorns, and stores them for later use. Usually encountered in pairs or small parties; sometimes as many as 30 or 40 congregate in winter and may loosely associate with both *G. glandarius* and *Urocissa flavirostris*. Forages in more open situations than either of those, and often found alongside mixed-species groups, such as babblers and laughingthrushes (Timaliidae), as they roam through shrubby gulleys. Readily perches in open situations, such as rock outcrops in forests, prominent treetops, or large bushes on scrubby hillsides.

Breeding. Eggs recorded in Apr and May. Probably has long-term pair-bond. Solitary breeder. Nest built by both sexes, a deep loose foundation of twigs, with deep cup lined with rootlets, grass stems and black fungal rhizoids (resembling horsehair), usually positioned c. 5–7 m from ground in fork towards top of small tree, usually an oak, or in large shrub on degraded hillside or near edge of forest. Clutch 3–5 eggs, mostly 3–4; incubation by female only, fed on nest by male, period 16 days; nestling period suspected to be c. 20 days, but confirmation required.

Movements. Resident, with some altitudinal migration linked with colder weather at higher elevations. In winter can be quite numerous about many Indian hill-stations, including Naini Tal, Mussooree, Simla and Kulu; also in Murree Hills, in Pakistan, and around city of Jalalabad, in Afghanistan.
Status and Conservation. Not globally threatened. Locally common in W Himalayas, especially so in Indian sector; reasonably common also across N Pakistan into extreme E Afghanistan; E limit of range in vicinity of Kathmandu, in Nepal, but throughout W regions of Nepal it is nowhere common. The future for this species appears to be secure, not least because of its tolerance of, and even preference for, secondary forest and scrubby slopes.
Bibliography. Ali (1949), Ali & Ripley (1972, 1987b), Bates & Lowther (1952), Goodwin (1951, 1953, 1954, 1956, 1986), Grimmett *et al.* (1998), Inskipp & Inskipp (1985), Kroker (1973), Madge & Burn (1994), Paludan (1959), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Vaurie (1959), Vietinghoff-Scheel (1992b), Zahler *et al.* (1997).

41. Lidth's Jay
Garrulus lidthi

French: Geai de Lidth **German**: Prachthäher **Spanish**: Arrendajo de Lidth
Other common names: Purple/Amami/Ryukyu Jay

Taxonomy. *Garrulus lidthi* Bonaparte, 1850, "Asia orientali" = Amami-O-shima, Japan.
This species and *G. lanceolatus* sometimes placed together in a separate genus, *Lalocitta*. Monotypic.
Distribution. Amami-O-shima, in N Ryukyu Is (S Japan).



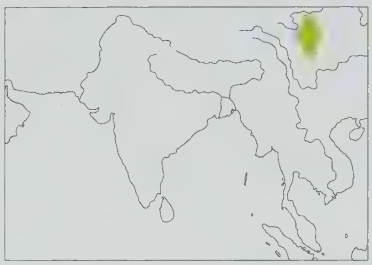
Descriptive notes. 38 cm; c. 125 g. A rather large, dark purplish-blue and chestnut jay with forehead and loral feathering somewhat stiffened, crown feathers very slightly elongated (can be inconspicuously erected), tail relatively longer than that of *G. glandarius* and somewhat graduated at tip, bill rather stout; in shade of forest overall appearance of a very dark bird, with contrasting pale bill and with narrow white trailing edge on innermost secondaries and tail. Has nasal tuft, forehead, loral region, chin and throat black, throat with short white streaks; remainder of head, neck, mantle and breast dark purplish-blue, lower breast gradually merging into rufous-chestnut, washed with mauve, of remainder of body plumage (with wear, chestnut colour prevalent as purplish feather fringes abraded); tail dark purplish-blue, black subterminal band and white tip; upperwing dark purplish-blue, wing-coverts and secondaries finely barred black, tertials unbarred but with prominent white tips; iris dark violet-blue; bill clear pale yellowish, greener base; legs dark grey. Sexes similar. Juvenile is much drabber than adult, with purplish areas of plumage dull brownish or dark greyish, and chestnut areas dull brown, lacks white tips on tertials and tail. VOICE. Most frequent call a harsh, grating "kraah", readily given in alarm by flushed birds, or when mobbing predators; can be uttered at variety of pitches. High-pitched mewing call presumed to be a contact call, as frequently heard from foraging birds. Screech call seems to be given only during display. May call repeatedly from tops of tall trees for up to 3 minutes, speeding up in frequency towards end and ceasing abruptly.
Habitat. Mature forest of various types, both subtropical evergreen broadleaf forest and conifers; also plantations or small stands of trees at edges of villages. Widespread both in lowlands and in mountains.
Food and Feeding. Omnivorous. Chiefly invertebrates, but also small snakes and lizards, during breeding season; at other times has fondness for chestnuts and acorns, and stores them for later use. Diet includes variety of seeds and berries, especially in autumn and winter, including small sweet-potatoes. Usually encountered in pairs or small parties; sometimes as many as 100 congregate in winter to roam through forest undergrowth and clearings. Rather ponderous, moving between foliage and branches and inspecting every nook and cranny; reported as using the relatively large bill as a climbing aid, giving impression like that of a parrot (Psittacidae). Readily perches in open situations, such as rock outcrops in forests, prominent treetops, or large bushes on scrubby hillsides.
Breeding. Eggs recorded in Feb and Mar. Probably has long-term pair-bond. Solitary breeder. Nest a foundation of twigs, with deep cup lined with rootlets and other soft plant materials, built up to 5 m from ground inside tree hole, on cliff ledge under overhang, or inside old building; maintains small breeding territory of 150–300 m². Clutch 3–5 eggs; no information on incubation and fledging periods.
Movements. Mainly sedentary; some altitudinal migration at higher elevations.
Status and Conservation. VULNERABLE. Restricted-range species: present in Nansei Shoto EBA. Found only on Amami-O-shima and nearby tiny island of Kakeroma-jima. In 1983 a single individual was reported from Iriomote-jima, in Yaeyama Is, but this most likely an escaped bird or a released illegal captive. Population estimated at 5800 birds in 1970s, but considered to have decreased considerably since then as a result of introduced predators, notably small Indian mongoose (*Herpestes auropunctatus*), and increasing numbers of *Corvus macrorhynchos*. Jay numbers once again rising, due to natural forest regeneration and efforts to control the mongooses. Was for many years persecuted through uncontrolled shooting and trapping for the fashion industry, its unusual plumage making it popular in the hat trade in early 20th century. Now fully protected by Japanese law, having been declared a National Monument; a National Wildlife Protection Area has been created at Yuwandake for present species and Common Scaly Thrush (*Zoothera dauma*) of highly endangered race *major*, often treated as a full species ("Amami Thrush"). In 1920s was said to have been common in C mountains of nearby island of Tokun-O-shima, but doubt has been expressed over this as no subsequent reports and no conclusive proof of its presence there.
Bibliography. Anon. (2008p), Austin & Kuroda (1953), Brazil (1991), Bruce (1975, 1979), Butchart & Stattersfield (2004), Ezra (1936), Goodwin (1986), Ishida *et al.* (1998), Madge & Burn (1994), Oliver (1964), Reichenow (1906), Stattersfield & Capper (2000), Takatsukasa (1937), Ueta & Yamaguchi (1997), Vietinghoff-Scheel (1992a).

Genus *PERISOREUS* Bonaparte, 1831

42. Sichuan Jay
Perisoreus internigrans

French: Mésangeai du Sichuan **German**: Sichuanhäher **Spanish**: Arrendajo de Sichuán
Other common names: Sichuan/Szechuan Grey Jay, Black-headed(!)/Chinese/Sooty Jay

Taxonomy. *Boanerges internigrans* Thayer and Bangs, 1912, Shuowlow, west Sichuan, China.
In certain aspects of structure (particularly bill shape) appears close to *Garrulus lanceolatus*, and some plumage features (e.g. faint suggestion of barring on secondaries) echo that genus, but drabness of plumage (resembling juveniles of darker populations of *P. canadensis*) and vocalizations much nearer present genus; could perhaps be considered a link between the two genera. On the other hand, recent DNA-sequencing indicates that this genus and *Cyanopica* form unique clades, separate from other corvids; significance of this requires further research, but it may suggest that *Perisoreus* is not very closely related to *Garrulus*. Probably forms a superspecies with *P. infaustus* and *P. canadensis*. Monotypic.
Distribution. C China from extreme SW Gansu S along borders of N Sichuan (Min Shan range), also extreme SE Qinghai and extreme NE & E Xizang.



Descriptive notes. 30 cm; 92–123 g. A relatively small and quite long-tailed sooty-grey jay, with a small but often surprisingly conspicuous, pale bill. Similar in proportions to *P. canadensis* of North America, but somewhat larger, and with a stouter bill. Entire plumage medium-dark grey, becoming almost blackish on head and throat; throat feathers blackish at tip with greyer bases, which could show as a grey throat when blackish feather tips have worn away; thighs (feathered portion of tibia) also blackish; wings and tail somewhat darker, with brown tinge to wing feathers; bill yellowish-olive to horn (can appear strikingly pale against darkness of remainder of plumage), with a distinct angle along lower mandible; nasal tuft short and dense; iris brown; legs blackish. All plumages seem to be similar. VOICE. Two types of call recorded, both given by foraging birds, but neither seems to be far-carying and could well be forms of contact call. One call is a high-pitched, rather plaintive "kyip", with a rising inflection, which can be accelerated into a more prolonged "kyip, kyip, kyip, kyip, kyip,ip,ip,ip,ip,ip" which has something of a woodpecker (*Dendrocopos*)-like quality about it. The other call is a buzzard (*Buteo*)-like plaintive mewing "meeeoo-meeeoo", also delivered with a rising inflection.
Habitat. Dense coniferous forests on slopes of mountain valleys and on high plateaux, between 2800 m and 4270 m. Generally found in mixed spruce (*Picea*) and mature fir (*Abies*) or in fir with a rhododendron (*Rhododendron*) understorey; can be found also in rather dry high-altitude coniferous forest with poorly developed understorey.
Food and Feeding. Omnivorous; diet includes seeds, berries, insects and other invertebrates; said also to take carrion. Forages in pairs or family groups amid dense foliage of conifers, where difficult to see. Searches along branches and on main trunk from mid-height upwards, inspecting and pecking at scaly bark; then moves on to an adjacent tree, or drops down slope to work another patch of forest. Sometimes perches briefly at top of tall conifer, and frequently feeds on ground. The slight chisel-like shape of lower mandible may be useful aid in prising open pieces of bark or even forcing open pine (*Pinus*) cones to get at nuts. Stores food in autumn; hides items behind bark and moss and among pine needles in a variety of caches, returning to dig out stores during cold winter months.
Breeding. Breeds Mar–May; nest construction begins Mar, incubation (probably wholly by female) from late Mar until mid-Apr, when eggs hatch, and young leave nest in early May. Probably monogamous. Solitary nester, but additional non-breeding helpers (probably relatives and young of previous breeding season) share territory and help to feed young. Two nests found, each contained clutch of 3 eggs; young forage with parents for some time, perhaps into following breeding season. No further information.
Movements. Presumed sedentary. In some regions not regularly seen during spring and summer, but this possibly due to even more secretive nature during breeding season.
Status and Conservation. VULNERABLE. Restricted-range species: present in West Sichuan Mountains EBA. Probably overlooked owing to its shy and unobtrusive habits, but clearly rare, with small, declining and fragmented population. Recorded at only 14 sites in total, in four states (mostly in N Sichuan and SW Gansu, with one or two sites in NE Xizang and E Qinghai); most records have involved small number of individuals. During survey in 1987 (walking at speed of 2 km/hour), average of fewer than two birds seen per hour; given relatively small number of documented localities and the species' apparently low population density, it could have a small global population. Its range has become fragmented following long-term timber-felling throughout, and recent climatic changes over Qinghai–Xizang plateau, which has become progressively drier during recent decades. E part of its range overlaps with N range of giant panda (*Ailuropoda melanoleuca*), which has several quite extensive forest reserves allocated for its survival; most of these forests, however, have received little ornithological fieldwork, and present species has so far been found at only one protected area, Jiuzhaigou Nature Reserve (Sichuan), which has area of 200 km²; forest and other habitats are mainly in excellent condition, but this scenically beautiful reserve likely to be under pressure from tourism. Probably because of accessibility, majority of sightings in recent years have come from Jiuzhaigou and forests flanking nearby Sungpan Pass. Recently added to category 2 of China's list of protected species.
Bibliography. Anon. (2008p), Butchart & Stattersfield (2004), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1976, 1987), Goodwin (1986), Jing Yu *et al.* (2003), Lei Jinyu & Liu Yang (2006), MacKinnon & Phillipps (2000), Madge & Burn (1994), Martens & Sun Yuehua (2003), Meyer de Schauensee (1984), Stattersfield & Capper (2000), Stattersfield *et al.* (1998), Sun Yuehua *et al.* (2001), Zhao Zhengjie (1995).

43. Siberian Jay
Perisoreus infaustus

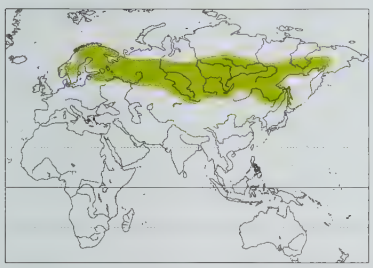
French: Mésangeai imitateur **German**: Unglückshäher **Spanish**: Arrendajo Siberiano
Other common names: Grey Jay(!)

Taxonomy. *Corvus infaustus* Linnaeus, 1758, Europae alpinis sylvis = Sweden.
Recent DNA-sequencing indicates that this genus and *Cyanopica* form unique clades, separate from other corvids; significance of this requires further research, but it may suggest that *Perisoreus* is not very closely related to *Garrulus*. Probably forms a superspecies with *P. internigrans* and *P. canadensis*. Geographical variation complex, with clines in colour tones, greyest in C Siberia and becoming more rufous towards W and again towards E, but tones and extent of rufous in wing vary also from S to N; further, clinal intergradation has created much taxonomic confusion in terms of number of races that should be recognized, various reviews allowing as many as 17 and as few as four. Conservative assessment suggests that *manteufeli* (from upper R Severnya Dvina, in NW Russia) be included within nominate, that *monjerensis* (lower R Yenisei to Olenek basin, in C

Siberia) is synonym of *ostjakoram*, that *bungei* (NC Siberia between lower R Lena and lower R Kolyma) and *sokolnikowi* (NE Siberia) be treated as synonyms of *jakutensis*, that *rogosowi* (Yenisei valley S to Sayan Mts) and *suschkini* (Transbaikalia, Russia) be synonymized with *sibericus*, that *varnak* (NE China and middle R Amur, in SE Russia) be considered synonym of *tkachenkoi*, and that *sakhalinensis* (Sakhalin) be considered synonymous with *maritimus*. Nine subspecies currently recognized.

Subspecies and Distribution.

P. i. infaustus (Linnaeus, 1758) – Norway, Sweden, Finland, Estonia and NW Russia.
P. i. ostjakoram Sushkin & Stegmann, 1929 – N Russia E (S to 64° N) to W R Lena basin.
P. i. yakutensis Buturlin, 1916 – C & E Russia (Siberia from R Yenisei E to Anadyrland).
P. i. ruthenus Buturlin, 1916 – W Russia (from St Petersburg E to Tomsk, S of Ostjakoram).
P. i. sibericus (Boddaert, 1783) – C Russia (C Siberia) and N Mongolia.
P. i. tkachenkoi Sushkin & Stegmann, 1929 – E part of SC Russia (Yakutsk S to Zhigansk, on R Lena, E to middle Amur and Stanovoy Mts).
P. i. opicus Bangs, 1913 – E Kazakhstan, NW China (N Xinjiang), SC Russia (Tuva, W & C Altai and W Sayans).
P. i. caudatus Buturlin, 1913 – NC Mongolia and CS Russia (S Buryatia).
P. i. maritimus Buturlin, 1915 – E Russia (Amurland, Ussuriland), NE China (NE Heilongjiang) and Sakhalin I.



Descriptive notes. 25–31 cm; 72–101 g. A drab brownish or greyish, relatively long-tailed forest jay with some rufous in tail and wing; bill short and small, with straight culmen but lower mandible somewhat upturned towards tip. Nominate race has head and nape dusky brown, blackest on lores and about eye, contrasting with very pale buff nasal tuft, and lighter buffy-grey throat and underparts, latter washed rufous-cinnamon on breast and flanks, becoming purer cinnamon on lower belly and undertail-coverts; mantle, back and scapulars buffy brown, washed grey in fresh plumage, with lower scapulars washed cinnamon; rump cinnamon-brown, grading into bright rufous on uppertail-coverts; central pair of tail feathers grey, remainder bright cinnamon-rufous, narrowly tipped and edged grey; lesser and median upperwing-coverts grey-brown to buff-brown, greater coverts (except dusky innermost) cinnamon-rufous, alula and flight-feathers blackish-grey, cinnamon-rufous wingpanel formed by bases of flight-feathers (obvious in flight), paler and more extensively pinkish-cinnamon on underside; iris dark brown; bill and legs blackish. Sexes similar in plumage, male on average larger than female. Juvenile has distinctly shorter and looser body plumage than adult, has less obvious dark hood, and is greyer overall. Races differ mainly in plumage tone and amount of rufous in wing: *ostjakorum* has light grey body, virtually no rufous in wing; *yakutensis* has very grey body and extensive rufous in wing; *ruthenus* is mainly rufous-buff on body, but with little rufous in wing; *sibericus* has buffish-grey body, extensive rufous wingpanels; *tkachenkoi* has pure grey body plumage, intermediate extent of rufous in wing; *opicus* is dark-hooded and rufous, with intermediate extent of rufous in wing; *caudatus* has dusky grey-brown body and minimal amount of rufous in wing; *maritimus* has buffish body, moderate deep rufous wingpanels. Voice. Vocabulary quite varied, but all vocalizations rather subdued. Song an insignificant twittering and chattering, mixed with whistling and mewing cries, includes mimicry of other birds, i.e. tits (Paridae), *Turdus* thrushes, redpolls (*Carduelis*) and bullfinches (*Pyrrhula*). Most audible is a harsh "kreee", rather softer than similar call of *Garrulus glandarius*, and a mewing reminiscent of that of buzzard (*Buteo*). When agitated may give nervous, repeated "ful-ful" or "fu-fee" at variety of speeds and pitches, as well as high-pitched repeated "jik" (similar to that of some *Dendrocopos* woodpeckers). In recent experimental studies, this species used 14 different calls when mobbing predators; these provided information to other group-members about both the category of predator and, simultaneously, the risk posed by it at the particular time.

Habitat. Boreal forest (taiga zone); favours dense closed-canopy, mature forest of spruce (*Picea*), pines (*Pinus*) and larches (*Larix*), with stands of birches (*Betula*). Lowlands and foothills, to 2200 m in Altai Mts.

Food and Feeding. Omnivorous. Diet includes berries, seeds, various insects and their larvae, notably beetles (Coleoptera) and moths (Lepidoptera), and wide variety of other invertebrates; feeds on carrion, and scavenges scraps provided by humans; takes eggs and nestlings of small birds, and small rodents; exceptional reports of chasing and killing adult birds, e.g. Willow Tit (*Poecile montanus*). Although generally unobtrusive, can be conspicuous and often very tame in remote areas, even coming to take food from the hand; scavenges at camp-sites, seeking out temporary ones by locating fires. Feeds in pairs or family groups, spending much time on the ground; in spring feeds actively in crowns of conifers, at other seasons much lower in tree foliage. Searches along branches and main trunk, pecking at scaly bark; then moves on to adjacent tree, or drops down slope to work another patch of forest. Sometimes perches briefly at top of tall conifers. On occasion will take flying insects flycatcher-fashion from treetops, or even by leaping from ground. Stores food items for winter but, unlike most other hoarding jays, conceals these in crevices of tree bark, using its very sticky saliva to stick them into position; saliva can also be used for sticking pieces of bark or needles over foodball for concealment. May store up to 200 items in one day.

Breeding. Breeds late Mar to May. Monogamous, with lifelong pair-bond. Solitary nester, but additional bird sometimes present with pair and may help with incubation or brood-feeding (such helpers probably relatives and young birds from previous breeding season); nests 500–1000 m apart. Male initiates building, soon joined by female, construction work taking 11–26 days; nest a rather loose structure of twigs, with well-lined cup of lichens, feathers and reindeer (*Rangifer*) hairs, placed at base of branch close to trunk of tree; breeding territory 45–57 ha. Clutch 3–4 eggs, but 6 reported from nest with two females sharing incubation; incubation wholly by female, period 19 days; chicks brooded by female, fed only by male for first few days, thereafter fed by both sexes, nestling period 21–24 days; after leaving nest young fed by adults for at least a month, but often beg throughout first year. May breed in parents' territory in second year, but most do not commence breeding until they have established own territory, typically in third year. Oldest ringed individual reached 11 years 5 months.

Movements. Sedentary over most of range. In W, rarely moves S in winter as far as St Petersburg and Moscow region, from where only two reports (both in Oct) in 60 years up to 1968. Farther E, likely that populations in extreme N move S in some winters, as indicated by Jan and Feb influxes in Yakutsk region. Vagrancy extremely rare, but reported from Estonia (where formerly bred), Latvia, Poland, Belarus, Slovakia and Ukraine.

Status and Conservation. Not globally threatened. Common to abundant; unobtrusive habits no doubt give false impression of scarcity, but this species, with a range extending across entire length of boreal zone of Palearctic Region, must have a very large global population. In parts of European range it is declining, owing to felling and fragmentation of forests, the latter opening up dense forest and allowing such predators such as *Corvus corax* easier access to nests of this and other bird species. Most noticeable range contraction has been in NE Baltic; probably ceased breeding in Estonia in mid-19th century, since when has become hardly more than a vagrant there; marked decrease in Finland, population falling by two-thirds between 1940s and 1970s, decline continuing into 1990s, and in 1992 Finnish population estimated at between 40,000 and 70,000 pairs. Despite quite extensive forest clearance in N Sweden, a decrease has hardly been noticed in either Sweden or Norway; Swedish population estimated at 50,000–200,000 pairs, with between 10,000–50,000 pairs in Norway and between 10,000 and 100,000 pairs in European Russia. Little published on populations of C & E Siberia, although population density seems to be greater in C Siberia than in Europe; as many as 12–16 birds/km² reported from mixed fir, birch and larch forests of S taiga of C Siberia, whereas densities in prime habitats in N Sweden have not exceeded 2 birds/km².

Bibliography. Blomgren (1964, 1971), Buturlin (1915), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1976, 1987), Coombs (1978), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Ekholm (1989), Ericson *et al.* (2005), Goodwin (1986), Hagemeijer & Blair (1997), Helle & Järvinen (1986), Hudec (1993), Järvinen *et al.* (1977), Lindgren (1975), Madge & Burn (1994), Nechaev (1991), Rogacheva (1988, 1992), Stepanyan (2003), Tucker & Heath (1994), Vaurie (1959, 1964).

44. Grey Jay

Perisoreus canadensis

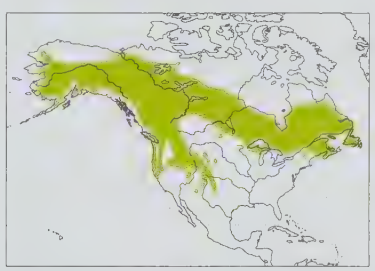
French: Mésangeai du Canada **German**: Meisenhäher **Spanish**: Arrendajo Canadiense
Other common names: Canada Jay

Taxonomy. *Corvus canadensis* Linnaeus, 1766, Quebec, Canada.

Recent DNA-sequencing indicates that this genus and *Cyanopica* form unique clades, separate from other corvids; significance of this requires further research, but it suggests that *Perisoreus* is not very closely related to *Garrulus*. Probably forms a superspecies with *P. internigrans* and *P. infaustus*. Size tends to increase clinally from S to north (and perhaps from coast towards interior). Additional proposed races are *arcus* (described from Coast District, in British Columbia) and *nigricapillus* (from Labrador), both subsumed in nominate, and *griseus* (L Keechelus, in Washington), considered a synonym of *obscurus*. Six subspecies recognized.

Subspecies and Distribution.

P. c. pacificus (J. F. Gmelin, 1788) – Alaska and NW Canada (Yukon and NW British Columbia).
P. c. canadensis (Linnaeus, 1766) – N Canada from MacKenzie River Delta E to Labrador, Newfoundland and Nova Scotia, S to N Alberta, C Saskatchewan and S Manitoba, S in N USA to NE Minnesota E to N New England.
P. c. albescens J. L. Peters, 1920 – E Rocky Mts (from SE Yukon, S Northwest Territories, NE British Columbia and NW & C Alberta) E to C Saskatchewan and WC Manitoba, S in USA to E Montana, NE Wyoming, Black Hills of South Dakota and NW Minnesota.
P. c. obscurus Ridgway, 1874 – SW British Columbia (including Vancouver I) and W USA in W Washington (Olympic Peninsula and Cascade Mts), Oregon (Cascade and Coast Ranges) and extreme N California.
P. c. bicolor A. H. Miller, 1933 – NC Rocky Mts from SE British Columbia S in USA to E Washington, E Oregon and Idaho.
P. c. capitalis S. F. Baird, 1874 – S Rocky Mts in E Idaho, W Wyoming, C Utah, W Colorado, EC Arizona and NC New Mexico.



Descriptive notes. 27–31 cm; 50–85 g. A small, crestless, long-tailed jay with grey, white and black plumage. Nominate race has forehead, forecrown, face, neck and upper breast bright white to light greyish-white, distinct black to dark brown central crown back to nape (extending down to level of eye); upperparts, including upperwing and tail slate-grey; underparts below breast light grey, slightly darker on side of breast and flanks, whitish on undertail-coverts; in worn plumage generally browner; iris dark brown; bill and legs black. Sexes similar, male c. 10% larger than female. Juvenile is darker than adult, uniformly blu-ish-slate above and slightly lighter below, head dull blackish-slate, lower abdomen whiter than rest of underparts, wings and tail dark slate-grey with whitish tips; after body moult in late summer–early autumn similar to adult, except for narrow and poorly defined whitish areas at tips of secondary coverts and finely tapered (rather than truncate) rectrices. Races vary mainly in depth and tone of coloration and in head pattern, also in size: *pacificus* is relatively large-bodied, has less white in crown than nominate, and dorsal plumage brownish-grey; *albescens* is relatively pale; *obscurus* is small-bodied and distinctively white-bellied; *bicolor* has reduced dark crown patch, and dorsal plumage grey and black (intermediate between nominate and *capitalis*); *capitalis* is small, with pale grey back, and distinctive white head owing to reduced and less dark crown patch. Voice. A very quiet-voiced corvid, often seen before it is heard. Accomplished mimic (often of various raptors), with described repertoire of ten vocalizations; in need of further study. Members of social group stay in contact with frequently repeated single "whuit" notes; two-part clear whistle, "whee ooo", may be used by male to invite mate to follow; social conflict indicated by rapid series of low-pitched semi-musical "chook, chook, chook"; territory defence and aggression signalled with "chick-wurr" (emphasis on second syllable). Pair-members may "twitter" softly while together and compose soft, melodious "whisper-song". Predators mobbed with loud, harsh, grating, rapid series of "cha-cha-cha-cha"; discovery of a stationary predator may elicit a series of soft musical whistles, "hoo, hoo, hoo". Young and adults (both sexes) beg from providers in typical corvid fashion. Constrained or captured adults may give hoarse, grating "screams".

Habitat. Coniferous and mixed conifer–deciduous (especially *Populus* and *Acer*) forests of N latitudes and high mountain elevations (2440–3050 m in S Rocky Mts). Spruce (*Picea mariana*, *P. glauca*, *P. engelmannii*, *P. sitchensis*) a common denominator of most forests where this jay occurs. Most common in large, ancient, contiguous forests of *Pseudotsuga menziesii* and *Picea sitchensis* on Olympic Peninsula (which contrasts with greater occurrence of *Cyanocitta stelleri* in fragmented, variable-aged forests and brush clearcuts). Absent from coniferous forests lacking spruce in Sierra Nevada and SW Oregon.

Food and Feeding. Omnivorous. Diet includes beetles (Coleoptera), Lepidoptera, Hymenoptera, flies (Diptera), bugs (Hemiptera), Orthoptera; also spiders (Araneae), centipedes (Chilopoda); also berries, regularly of *Vaccinium*; fungi (including poisonous *Amanita*). Occasionally preys on small vertebrates, e.g. small passerine birds, frogs, snakes, mice, shrews, voles, and bird-nest contents; rarely, pursues and catches small adult songbirds in flight. Known to glean blood-engorged ticks

(Ixodoidea) from large ungulates. Regularly takes and carrion (from great variety of aquatic and terrestrial animals). Boldly takes food from humans; regular visitor to birdtables and unattended pet food, and common denizen of picnic areas and campgrounds in appropriate habitat. Forages in small groups (typically of 2–4 individuals) from tree canopy to ground; systematically searches foliage. Moves between trees with short flights and glides to vantage points. Sophisticated forager that appears to process considerable information to select food items. In field experiments, decisions on food selection apparently based on context, including relative reward rate (less selective when rewards frequent), relative size of and difficulty of obtaining reward, and presence of novel, unattractive rewards. Prodigious cacher of excess food; in Alaska, may make more than 1000 caches in a single summer day and total of order of 100,000 during summer and autumn; hoards opportunistically at all times of year. Enlarged salivary glands utilized for coating and impregnating food items, which then cached in trees behind bark, in branches, in foliage, or under moss and lichens; caches often covered with bark, lichen, moss or foliage. Uses short-term memory of cache locations to recover stores; caches may be optimally spaced, trading off need to minimize travel distance against need to minimize excessive risk of theft by competitors.

Breeding. Nesting begins in late winter, when snow is substantial, laying late Feb to mid-Apr. Permanent monogamous pair-bond. In Algonquin Provincial Park (C Ontario, in Canada), 20% of pairs accompanied by third individuals (75% of which were offspring, usually male, of pair); third bird aggressively excluded from nest by breeding male, but sometimes allowed to feed fledglings, and mobs potential predators, defends territory against intruders, and gives alarm calls. Defends all-purpose territory of average size 40–146 ha. Male selects nest-site; nest a bulky outer platform (14–16 × 10–15 cm) of twigs well insulated with cocoons placed in exterior interstices, with thick inner cup (7·8 × 5·6 cm) of shredded bark, lichens, hair and feathers, placed 1·7–15 m above ground close to trunk of coniferous tree (especially spruce or fir). Clutch 1–5 eggs, usually 3–4; incubation by female alone (may occur at temperatures as low as –30°C), period 18·5 days; chicks brooded by female, fed by both sexes; male feeds female, usually off the nest, often with previously stored food; nestling period 22–24 days; young fed by parents, and sometimes by helper (when present), for c. 1 month after fledging; family breaks up when young 55–65 days old, as dominant juveniles force subordinates to disperse, and by late summer/early autumn fewer than 50% of pairs have juveniles (usually one, sometimes two); retained juveniles frequently (30% of pairs in Algonquin Provincial Park) unrelated subordinates forced to disperse from natal territory that are accepted by pairs without juveniles. Nest predators include pine squirrels (*Tamiasciurus*). Maximum recorded lifespan 16 years.

Movements. Resident; most pairs spend entire breeding life on a single territory. Some annual movements in S part of range (including Olympic Peninsula) from high to low elevations, and to reliable food sources (human-provided) during winter. Occasional irruptive movements in areas S of normal range. Widowed breeders may disperse c. 10 km to fill breeding vacancies; subordinates expelled from natal territory known to disperse up to 11 km.

Status and Conservation. Not globally threatened. Locally common. Populations generally stable; range contracting in some S areas (Alberta, Michigan, Quebec) and potentially at substantial risk from warming climate. Population in Algonquin Provincial Park, at S edge of range (Ontario), has undergone rapid decline since 1980. Timing and success of breeding attempts appears to be compromised by warm autumns, suggesting that climate warming may have caused rotting of food hoards; possible poleward shift of species' range via contraction along S edge. Exotic disease (e.g. West Nile Virus) could become additional concern. Most core areas of range are at latitudes or elevations where human exploitation of resources currently minimal; this species' use of unfragmented, structurally complex forests does, however, make it vulnerable to logging and road-building should human activities intensify within the jay's range. Potential role of this species as nest predator of other sensitive birds, e.g. Marbled Murrelet (*Brachyramphus marmoratus*) in NW USA and SW British Columbia, especially where jays locally congregate to exploit human subsidies, is a recent concern.

Bibliography. Bock (1961), Bryan (1974), Bunch & Tomback (1986), Dow (1965), Ericson *et al.* (2005), Espinosa de los Monteros & Cracraft (1997), Gutzwiller *et al.* (2002), Ha & Lehner (1990), Ha *et al.* (1990), Ibarzabal & Desrochers (2005), Lubinbuhl *et al.* (2001), Maccarone & Montevecchi (1986), Marzluff *et al.* (2000), Nevai *et al.* (2007), Ouellet (1970), Raphael *et al.* (2002), Rutter (1969), Sauer *et al.* (2001), Saunders & Edwards (2000), Shafir *et al.* (2001), Strickland (1991), Strickland & Ouellet (1993), Strickland & Waite (2001), Tozer & Allen (2004), Waite (1990, 1991a, 1991b, 1992, 2001a, 2001b, 2002), Waite & Field (2000), Waite & Passino (2006), Waite & Reeve (1992a, 1992b, 1993, 1994, 1995), Waite & Strickland (1997, 2006), Waite & Ydenberg (1994, 1996).

PLATE 33 ➤



PLATE 33

inches 5

cm 13

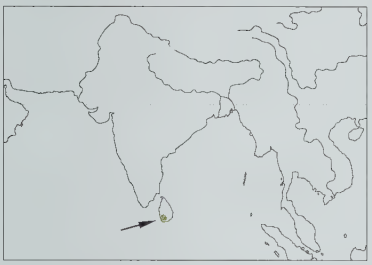
Genus *UROCISSA* Cabanis, 1851

45. Sri Lanka Blue Magpie

Urocissa ornata

French: Pirolle de Ceylan **German**: Schmuckkitta **Spanish**: Urraca Cingalesa
Other common names: Ceylon Blue Magpie, Ceylon/Sri Lanka Magpie

Taxonomy. *Pica ornata* Wagler, 1829, "India orientali" = Sri Lanka.
Genus has sometimes been subsumed in *Cissa*, but three members of latter seem to form a distinctive group; present species perhaps links the two genera. Monotypic.
Distribution. SW Sri Lanka.



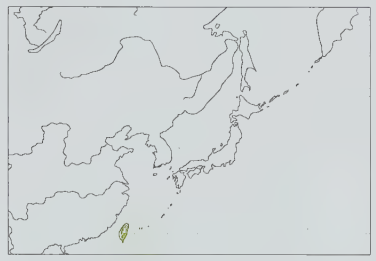
Descriptive notes. 40–47 cm; one bird 196 g. Unmistakable, gaudy forest magpie with rather prominent bill, nostrils concealed by soft plumes (not bristles), wide area of bare skin about eye, slightly crested rear crown, long and strongly graduated tail with projecting central feather pair. Whole head down to nape, throat and upper breast reddish-chestnut; remainder of body plumage purplish-blue, becoming sky-blue on rump and uppertail-coverts and on belly and undertail-coverts; upperwing-coverts dark purple-blue, except for lighter purple-blue lesser coverts; primaries and secondaries chestnut-red, a shade redder and less brown than colour of head, inner webs of secondaries dark blue, tips showing as stripe down tertials merging into blackish primary tips formed by blackish inner webs of primaries; tail greenish-blue, feathers with broad white tips and black subterminal bars, white tips becoming progressively more extensive towards shorter outermost feathers; iris brown, orbital ring red, bare skin around eye deeper red; bill and legs coral-red. Sexes similar. Juvenile is duller than adult, body plumage washed greyish, all bare parts drabber and browner. VOICE. Noisy. Presence often first indicated by contact call, a loud, repeated, metallic "chink-chink-chink...", variable in emphasis and in number of repetitions; also utters loud, raucous "crakarakarakarak...". Variety of quieter calls given, including high-pitched squeaky "creeik" and rising "whee-whee"; parakeet-like "whittee" and a rapid "chit-chee-chit" could be variations of the above. Variety of short metallic chirps and squeaks may be heard from foraging party. In captivity subdued "song" noted, this consisting of a series of chattering, squeaking and chirping sounds incorporating some mimicry, including crowing of Ceylon Junglefowl (*Gallus lafayetii*). Most vocal early and late in day, especially so in wet weather; can be quiet for long periods.
Habitat. Tropical broadleaf evergreen forest, including edges of tea plantations. Occurs from as low as 50 m up to 2100 m, in lowlands and hills of wet zone.
Food and Feeding. Chiefly carnivorous; prey items include wide variety of invertebrates, especially crickets (Orthoptera), beetles (Coleoptera), caterpillars, especially large hawkmoth (Sphingidae) caterpillars; also tree-frogs and small lizards. Takes some fruits and berries, e.g. fruits of *Freycinetia*. Rubs hairy caterpillars against branches to remove hairs. Usually met with singly or in small parties of six or seven individuals, presumably family-based groups. Generally rather shy and difficult to observe; parties feed inside forest canopy and seem reluctant to cross open stretches of countryside. Forages at all levels, including forest floor, working up through the foliage, sometimes swinging upside-down at end of a branch like some giant gaudy tit (Paridae) or clinging to a tree trunk upside-down as it prises into bark crevices for invertebrates. Outside breeding season readily associates with mixed-species flocks of small birds, which generally include Sri Lanka Crested Drongos (*Dicrurus lophorinus*) and Ashy-headed Laughingthrushes (*Garrulax cinereifrons*).
Breeding. Season mid-Jan to late Mar. Solitary breeder. Nest of sticks and twigs, lined with fine roots and beard-like lichens (resembles that of *Corvus*, but smaller), generally placed 5–13 m from ground near top but inside canopy of tall sapling, or towards outermost part of branch of small tree. Clutch 3–5 eggs, usually 3; no information on incubation and fledging periods. Nest parasitized by Common Koel (*Eudynamys scolopacea*).
Movements. Sedentary.
Status and Conservation. VULNERABLE. Restricted-range species: present in Sri Lanka EBA. Locally fairly common. Although quite common in some places, parties have very large foraging areas, and therefore liable to give false impression of abundance. Fragmentation of rainforest habitat through forest fires and felling is biggest threat to this and many other Sri Lankan endemics; also, the breaking-up of formerly extensive forest has permitted increase in forest edge, which in turn has allowed increase in numbers of Common Koel, a nest parasite of this and other corvids. Healthy population present in Sinharaja Forest Reserve, where it can often be observed well near the reserve headquarters.
Bibliography. Ali & Ripley (1972, 1987b), Anon. (2008p), Butchart & Stattersfield (2004), Collar & Andrew (1988), Dickinson *et al.* (2004), Goodwin (1986), Grimmett *et al.* (1998), Harrison (1999), Henry (1971), Madge & Burn (1994), Phillips (1975), Rasmussen & Anderton (2005a, 2005b), Stattersfield & Capper (2000), Vaurie (1958a).

46. Taiwan Blue Magpie

Urocissa caerulea

French: Pirolle de Taiwan **German**: Dickschnabelkitta **Spanish**: Urraca de Formosa
Other common names: Formosan (Blue) Magpie, Taiwan Magpie

Taxonomy. *Urocissa caerulea* Gould, 1863, Taiwan.
Genus has sometimes been subsumed in *Cissa*, but three members of latter seem to form a distinctive group. Present species forms a superspecies with *U. flavirostris* and *U. erythroryncha*. Monotypic.
Distribution. Taiwan.
Descriptive notes. 63–68 cm; 254–260 g. Distinctive black-hooded, pale-eyed blue magpie with very long, strongly graduated tail, central pair of rectrices projecting beyond next by up to c. 40%;



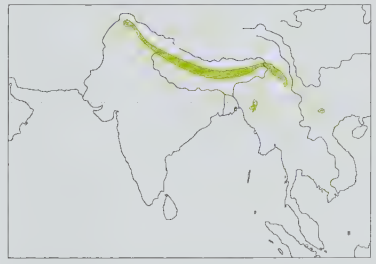
rather stout bill with curved culmen, nostrils concealed by soft plumes (rather than bristles), crown feathers slightly ruffled. Entire head down to upper breast and nape black with dark blue feather tips; remainder of body plumage deep azure-blue, narrow whitish fringes on undertail-coverts; uppertail-coverts black with narrow whitish scale-like fringes; upperwing dark azure-blue, narrow white fringes on tertials, minute white marks at primary tips; tail azure-blue, feathers with broad white tips and wide black subterminal bands (ladder-like impression when viewed from below); iris lemon-yellow to yellowish-white, narrow dull scarlet to blackish orbital ring; bill and legs scarlet. Sexes similar. Juvenile is duller than adult, body plumage more greyish-blue, with greyish-black hood, brown iris and drab pinkish bill and legs, but wings and tail similar to those of adult. VOICE. Usual call a loud chattering "kyak-kyak-kyak-...", not unlike call of *Pica pica* but slower and higher in pitch. Also a harsh, ringing "go-kang, go-kang" and several softer calls, notably a "kwee-eep" or "garsee-eep".
Habitat. Broadleaf forest at 400–1000 m, but reported down to 300 m and as high as 1200 m.
Food and Feeding. Omnivorous; as well as wide variety of invertebrates, takes various berries and figs (*Ficus*). Usually encountered in small parties of six or seven individuals, presumably family groups, but larger gatherings after young have fledged. Rather shy and wary, keeping very much inside forest canopy (making prolonged observation difficult). Although reluctant to cross open stretches of countryside, will do so in "follow-my-leader" manner typical of genus (several short flaps and a glide). Forages at all levels, including forest floor; on ground makes bounding hops with tail raised, the very end curving as if tip drooped.
Breeding. Season May and Jun; eggs recorded mid-May to late May. Social and co-operative breeder; helpers assumed to be young of previous year, which assist in feeding fledglings. Nest a quite large platform-like construction of sticks and twigs, built on horizontal bough at junction of several smaller branches. Clutch 5 or 6 eggs. No other information.
Movements. Mainly sedentary; some movement to lower elevations in winter.
Status and Conservation. Not globally threatened. Restricted-range species: present in Taiwan EBA. Status not well known; generally considered uncommon and elusive. Prefers to keep to shadowy gloom of dense forest (where it can appear to be wholly dark, but white-spotted tail conspicuous when it flies). Absent from lowland areas and C belt of mountains, but does occur in several protected areas, notably the Yangmingshan National Park and the Huisun National Forest Recreation Area. Fragmentation of forest habitat through felling is biggest threat to this and several other Taiwan endemics.
Bibliography. Brazil (1991, 1992), Chawner (1937), Chen Fuguan *et al.* (1998), Fang Woeihorng & Sykes (2004), Goodwin (1986), Lee Peifen *et al.* (1998), MacKinnon & Phillipps (2000), Madge & Burn (1994), Severinghaus (1986, 1987).

47. Yellow-billed Blue Magpie

Urocissa flavirostris

French: Pirolle à bec jaune **German**: Gelbschnabelkitta **Spanish**: Urraca Piquigualda
Other common names: Gold(en)-billed/Black-headed Magpie, Golden-billed Blue Magpie

Taxonomy. *Psilorhinus flavirostris* Blyth, 1846, Darjeeling, India.
Genus has sometimes been subsumed in *Cissa*, but three members of latter seem to form a distinctive group. Present species forms a superspecies with *U. caerulea* and *U. erythroryncha*. Race *cucullata* intergrades with nominate in C Nepal. Four subspecies recognized.
Subspecies and Distribution.
U. f. cucullata Gould, 1861 – N Pakistan (from Hazara) E through NW India to Nepal.
U. f. flavirostris (Blyth, 1846) – Nepal E to NE India and N Myanmar, also in adjacent S China (extreme SE Xizang).
U. f. schaeferi Sick, 1939 – W Myanmar (Chin Hills).
U. f. robini Delacour & Jabouille, 1930 – extreme N Vietnam (NW Tonkin).



Descriptive notes. 55–61 cm; 123–180 g. Distinctive black-hooded, pale-billed blue-and-white magpie with very long, strongly graduated tail, central pair of rectrices projecting beyond next by up to c. 40%, drooping towards tip; rather stout bill with curved culmen, nostrils concealed by soft plumes (rather than bristles). Nominate race has head down to upper breast and upper mantle velvety black, clear whitish patch on upper nape; upperparts dull grey-blue, washed with olive when plumage fresh, uppertail-coverts with narrow whitish subterminal bars and black tips; upperwing dull blue, tips of primaries and secondaries narrowly whitish (this pattern clearest on tertials); tail grey-blue, feathers with broad white tips and black subterminal bars (latter weakest on longest central pair); underparts below upper breast whitish, washed lightly with grey and pale yellow (latter only in very fresh plumage); iris dark brown; bill and legs yellow, light orange or rich orange. Differs from superficially similar *U. erythroryncha* in having yellow bill and orange legs (both often confusingly bright orange), white on head confined to nape patch (not extending onto crown or reaching mantle). Sexes similar. Juvenile is duller than adult, with dusky bill and legs, nape patch whitish and more extensive. Races differ mainly in strength of olive and yellow tones in fresh plumage, as well as size: *cucullata* is smaller than nominate, blue above, purer white below, juvenile has white on nape more extensive, from mid-crown to lower nape and, on some, even over malar region; *schaeferi* also is on average smaller, but is close to nominate; *robini* has brighter yellow wash below and brighter olive above than others. VOICE. Quite a loud and varied vocabulary, but difficult to interpret differences from *U. erythroryncha*. Calls include wheezy "buzeep-peck-peck-peck", high-pitched "clear-clear"; other calls can be harsh, grating, piercing, whistled

On following pages: 48. Red-billed Blue Magpie (*Urocissa erythroryncha*); 49. White-winged Magpie (*Urocissa whiteheadi*); 50. Common Green Magpie (*Cissa chinensis*); 51. Indochinese Green Magpie (*Cissa hypoleuca*); 52. Short-tailed Green Magpie (*Cissa thalassina*); 53. Iberian Azure-winged Magpie (*Cyanopica cooki*); 54. Asian Azure-winged Magpie (*Cyanopica cyanus*).

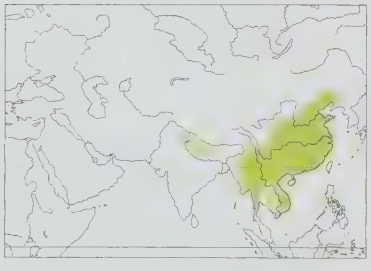
or squealing. Some recordings are of loud, strident raptor-like sounds, rising and falling in pitch. Other sounds clearly based on mimicry. Presumed alarm a gravelly, staccato "rak-rak-rak-rak"; also a series of faster notes, delivered at machine-gun speed.
Habitat. Moist deciduous and mixed temperate forests with oaks (*Quercus*), chestnuts (*Castanea*), conifers and rhododendrons (*Rhododendron*). Favours forest edge, such as clearings with settlements, with or without terraced agriculture; also borders of tea plantations and the like. Breeds above 2000 m, ascending to about 3600 m; occurs down to 1000 m farther E in range. More of a true forest bird than is *U. erythroryncha*; generally replaces latter above 1800 m in Himalayas.
Food and Feeding. Omnivorous, but mainly carnivorous. Takes all manner of invertebrates, small vertebrates and various fruits and berries; scavenges other bird's nests, taking both eggs and nestlings. Diet and general behaviour very much as *U. erythroryncha*. Usually in pairs or in parties of up to twelve individuals, presumably family-based groups. Generally rather shy, but can become relatively bold where food put down as offerings at temples by forest roadsides and passes. Forages at all levels, including forest floor, where it jumps about with tail raised, the very tip drooping. Group-members fly low across clearings, bounding along branches of trees and taking off one by one, finally swooping up under canopy of a tree. On occasion, one or two individuals have been found among parties of *U. erythroryncha*.
Breeding. Season late Apr to early Jul, with eggs reported mid-May and Jun. Most likely a solitary breeder with long-term pair-bond; could be a social breeder (as proven for closely related *U. caerulea*), as it is found in small parties throughout year. Nest built by both sexes, possibly with aid of a helper, made of sticks and twigs, cup lined with fine roots and plant fibres (resembles nest of *Corvus*, but smaller), positioned c. 5–6 m above ground in fork of long branch inside lower canopy, often in leafy sapling at edge of a clearing. Clutch 3–5 eggs, usually 4; incubation probably by female alone, fed at nest by male; chicks fed by both sexes, most of feeding by female; no information on incubation and fledging periods.
Movements. Mostly sedentary. Those inhabiting higher montane forests move to lower elevations in winter if weather conditions deteriorate; rarely descends as low as 1850 m in Nepal, while in Pakistan recorded down to 900 m.
Status and Conservation. Not globally threatened. Widespread and locally common over most of range, although at extreme W limits in Pakistan not well known. Races *robini* of NW Vietnam and *schaeferi* of W Myanmar (Chin Hills) poorly known, with restricted ranges; latter, at least, is known to be present at several forest sites. This species is clearly under no obvious threats, using secondary growth and thriving about mountain temples and villages.
Bibliography. Ali (1949, 1977), Ali & Ripley (1972, 1987b), Bates & Lowther (1952), Chen Fuguan *et al.* (1998), Dickinson *et al.* (2004), Fleming & Traylor (1964), Goodwin (1986), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Madge & Burn (1994), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Robson (2000), Robson *et al.* (1998), Stuart Baker (1928), Vaurie (1958a).

48. **Red-billed Blue Magpie**

Urocissa erythroryncha

French: Pirolle à bec rouge **German**: Rotschnabelkitta **Spanish**: Urraca Piquirroja
Other common names: Blue/Red-billed Magpie

Taxonomy. *Corvus erythrorynchus* Boddaert, 1783, Canton (Guangzhou) south China.
Genus has sometimes been subsumed in *Cissa*, but three members of latter seem to form a distinctive group. Present species forms a superspecies with *U. caerulea* and *U. flavirostris*. Race *alticola* initially described under name "*caerulea*", but this name is invalid, as preoccupied. Species name often misspelt "*erythrorhyncha*". Five subspecies recognized.
Subspecies and Distribution.
U. e. occipitalis (Blyth, 1846) – NW India (from Jammu and vicinity of Kangra, in Himachal Pradesh) E to extreme E Nepal.
U. e. magnirostris (Blyth, 1846) – NE India (S of R Brahmaputra) E across Myanmar and Thailand to NW Cambodia, Laos and Vietnam.
U. e. alticola Birckhead, 1938 – S China (NW & N Yunnan) and adjacent N Myanmar.
U. e. brevivexilla Swinhoe, 1874 – E China (from SE Inner Mongolia and W Liaoning S to S Gansu, S Ningxia, Shanxi and Hebei).
U. e. erythroryncha (Boddaert, 1783) – C, S & SE China (including Hainan).



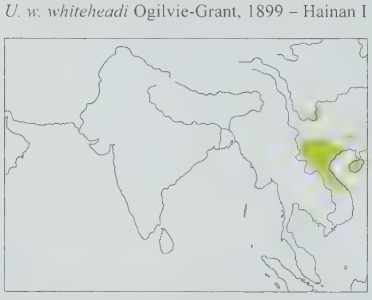
Descriptive notes. 53–64 cm; male 145–192 g, female 106–155 g. Highly distinctive blue magpie with exceptionally long, strongly graduated, sweeping white-spotted tail, central feather pair projecting beyond next by up to c. 40–50% and drooping towards tip; bill rather prominent, nostrils concealed by soft plumes (not bristles). Nominate race has head down to upper breast and upper mantle velvety black, feathers of rear crown and nape with extensive white tips (showing either as spangling or as whitish area, depending on extent of feather wear), feathers of forecrown also with tiny whitish tips; upperparts dull medium-blue with weak mauve wash, uppertail-coverts with narrow whitish subterminal bars and black tips; upperwing brighter blue with stronger mauve tones, tips of primaries and secondaries narrowly whitish with narrow dark subterminal lines (this pattern clearest on tertials); tail mauve-blue, feathers with broad white tips and black subterminal bars (latter weakest on longest central pair), white tips progressively more extensive towards shorter outermost feathers; underparts below upper breast whitish, washed lightly with grey (and can be tinged salmon-pink in very fresh plumage), undertail-coverts whiter; iris dark brown; bill and legs reddish-pink to coral-red. Differs from similar *U. flavirostris* in having bluer and whiter general appearance, extensive white speckles and spangling over most of crown and nape (and reaching mantle), and red bill. Sexes similar. Juvenile is duller than adult, with throat, face and breast centre whitish, leaving black as mask across face and side of neck, bill and legs drab greyish, becoming dull yellowish-flesh. Races differ mainly in overall brightness of adult plumage, to certain extent also size: *occipitalis* has relatively bright bluish upperparts, bold white fringes on tertials, juvenile has blackish throat and chest; *brevivexilla* is palest and greyest, with very extensive pale lavender (rather than white) patch on rear crown and nape; *alticola* has bluer upperparts than nominate; *magnirostris* is brightest race, with strongest mauve tones in quite blue upperparts, bill relatively larger than in others. Voice. Noisy. Presence often first indicated by contact call, a loud, ringing, almost metallic "penk-penk-penk...". Other calls include piercing "quiv-pig-pig", softer "beeee-trk" and subdued "kluk". Also a harsh staccato "cha-chak, cha-chak", which can be repeated into a chatter; also a prolonged high-pitched scream, and various whistles and rattling sounds. Versatile mimic, with calls of black giant squirrel (*Ratufa bicolor*), Crested Serpent-eagle (*Spilornis cheela*), hawk-eagles (*Spizaetus*), Shikra (*Accipiter badius*) and Jacobin Cuckoo (*Clamator jacobinus*) reported as imitated.
Habitat. Tropical and subtropical broadleaf evergreen forest in Himalayan foothills; elsewhere in hill forests, including parks, botanical gardens and large gardens. Recorded in mangroves in Hong Kong. Sea-level to 2200 m in summer, chiefly below 1500 m. Replaced at higher elevations by *U. flavirostris* where ranges overlap, mainly in Himalayas.
Food and Feeding. Omnivorous, but mainly carnivorus. Recorded prey items include wide variety of larger invertebrates, especially beetles (Coleoptera), caterpillars, also land-leeches (Hirudinea), tree-frogs, small lizards, birds' eggs and nestlings, and even small mammals; also carrion and kitchen scraps. Variety of fruits and berries also taken. Usually encountered in small parties of six or seven, sometimes up to twelve, individuals, presumably family-based groups. Generally rather shy, but in some areas scavenges about villages and forest settlements, where may become less wary. Parties fly low across clearings in follow-my-leader style, swooping up under canopy of a desired tree. Forages at all levels, including forest floor, where it jumps about with tail raised, the very tip drooping. Occasional records of one or two *U. flavirostris* mixed with foraging parties of present species.
Breeding. Eggs reported Apr–Jun in India, Mar–Jun in Myanmar, Apr in S China and Jun in N China. Generally considered solitary breeder, but encountered throughout year in small parties and probably, therefore, social breeder (as proven for closely related *U. caerulea*). Nest built by both sexes, of sticks and twigs, cup lined with fine rootlets and plant fibres, generally 3–6 m above ground inside upper canopy of sapling or near end of long bough of larger tree. Clutch 3–6 eggs, usually 3; male feeds incubating female at nest and helps to feed nestlings; no information on incubation and fledging periods.
Movements. Mainly sedentary, but moves higher into montane forests in summer. One reported in Jun 1979 at exceptionally high elevation of 3050 m in W Nepal.
Status and Conservation. Not globally threatened. Widespread and locally common over most of extensive range. In extreme NE of range in China, said to be distinctly uncommon in Liaoning and Jilin; on the other hand, considered increasingly numerous in recent years in vicinity of Beidaihe (Hebei). Small feral population, originating as escaped cagebirds, became established for a while on Oahu, in Hawaiian Is, but seems now to have been exterminated.
Bibliography. Ali (1949, 1977), Ali & Ripley (1972, 1987b), Chen Fuguan *et al.* (1998), Dickinson *et al.* (2004), Goodwin (1986), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Lekagul & Round (1991), Madge & Burn (1994), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Stuart Baker (1928), Vaurie (1958a).

49. **White-winged Magpie**

Urocissa whiteheadi

French: Pirolle de Whitehead **German**: Graubauchkitta **Spanish**: Urraca de Whitehead
Other common names: White-winged Blue/Whitehead's Magpie

Taxonomy. *Urocissa whiteheadi* Ogilvie-Grant, 1899, Five-finger Mountains, interior of Hainan, China.
Genus has sometimes been subsumed in *Cissa*, but three members of latter seem to form a distinctive group. This species sometimes allocated its own monotypic genus, *Cissopica*, but seems to possess sufficient features to allow its retention in present genus. Races well differentiated, possibly worthy of separate species status; further research required. Two subspecies recognized.
Subspecies and Distribution.
U. w. xanthomelana (Delacour, 1927) – S China (S Sichuan and SW Guangxi), N Vietnam (W & E Tonkin and N & C Annam) and N & C Laos.
U. w. whiteheadi Ogilvie-Grant, 1899 – Hainan I (SE China).



Descriptive notes. 43–46 cm; c. 200 g. A bulky-bodied forest magpie with relatively long and strongly graduated tail, central pair of feathers only a little longer than next; bill quite heavy and long, nasal tuft soft, small patch of bare skin behind eye. Nominate race has head, neck and breast sooty brown, crown feathers with narrow brownish fringes; upperparts blackish, rump yellowish, uppertail-coverts greyish with white feather bases and yellow tips; upperwing boldly patterned white to faintly yellowish-white on blackish background, lesser and median coverts white (forming band along leading edge of wing), greater coverts white with black bases (central wingband), inner secondaries with pale fringes, becoming wider towards outer wing, largest on tertials, which are whitish with black basal portion (these form whitish patch at base of hindwing and pale trailing edge on secondaries); tail largely black, central feathers grey with narrow black subterminal band, some yellowish-grey at base, all feathers with wide pale yellow-white or white tips, narrowest on central pair and most extensive on outermost (shortest) pair; underparts below breast greyish, shading into pale yellowish on belly and undertail-coverts; underwing and axillaries pale yellow; iris pale yellow, bare eye patch brownish-green; bill dull orange, greenish base; legs black. Sexes similar. Juvenile and first-year have head, neck and upperparts drab yellowish-grey, bill and iris drab brownish; older immature acquires reddish bill and pale iris before mantle blackens. Race *xanthomelana* is somewhat larger than nominate, has head, neck and breast black, throat and breast with yellowish bloom, more yellow in white wing and tail markings, central rectrices mostly black (not grey). Voice. Most frequently uttered call a repeated, hoarse, rising "shurreek". Similar, but lower in pitch, is a hoarse, almost purring "churrree", a repeated soft, liquid, rippled "brrriii...brrriii..." and a similar but harsher, rising "errreeep... errreeep...".
Habitat. Tropical broadleaf evergreen forests, including edges of cultivation and secondary growth; found particularly along watercourses in forest. Lowlands and foothills, from 50 m up to 1400 m.
Food and Feeding. Not well documented. Apparently omnivorous; said to feed on various invertebrates and berries, but no specific information available. Very sociable; large groups of 20–25 individuals (in various plumage stages) move through forest together. These foraging parties are quite active, flitting from tree to tree and into bamboo thickets in gulleys by streams.
Breeding. Little known. Perhaps a social breeder; seems to be encountered in quite large parties throughout year. Only described nest, on Hainan (nominate race), was a concave platform of closely interwoven stems of creepers and roots; nest under construction reported from Vietnam in Jul. Clutch 6 eggs. No other information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Nominate race rare; race *xanthomelana* widespread on mainland, where locally not uncommon. Fragmentation of rainforest habitat through forest fires and felling is biggest threat. Particularly vulnerable is population of nominate race, confined to Hainan; huge-scale forest destruction on Hainan during Chinese Cultural Revolution,

but remnant patches of forest still remain, particularly on S side of the island, where species continues to be reported in very small numbers. Mainland form *xanthomelana* is much more widespread, but remains poorly known in China; known to occur in two protected areas in S Guangxi (Nonggang and Shiwandashan National Nature Reserves). In Vietnam not uncommon in forests S to C Annam, where described as common in Cat Bin area, and regarded as locally common in adjacent C Laos.
Bibliography. Chen Fuguan *et al.* (1998), Collar & Andrew (1988), Duckworth *et al.* (1998), Evans & Timmins (1998), Goodwin (1986), Lee Kwok Shing *et al.* (2006), Lei Jinyu & Liu Yang (2006, 2007), MacKinnon & Phillipps (2000), Madge & Burn (1994), Robson (2000), Vaurie (1958a).

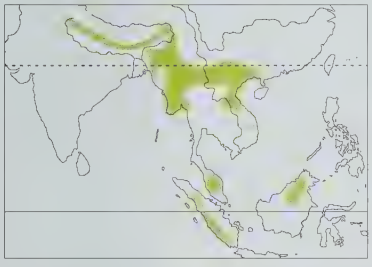
Genus *CISSA* Boie, 1826

50. Common Green Magpie

Cissa chinensis

French: Pirolle verte **German**: Jagdelster **Spanish**: Urraca Verde
Other common names: (Chinese) Green Magpie, Hunting Greenpie/Cissa, Green Hunting Crow

Taxonomy. *Coracias chinensis* Boddaert, 1783, Mergui, Tenasserim, Myanmar.
Although often expanded to encompass *Urocissa*, present genus is distinctive in appearance of its members (the green magpies). This species forms a superspecies with *C. hypoleuca* and *C. thalassina*. Race *robinsoni* poorly differentiated from *minor*, and perhaps better merged with it. Five subspecies tentatively recognized.
Subspecies and Distribution.
C. c. chinensis (Boddaert, 1783) – Himalayas from Uttarakhand (Garhwal) E to NE India (Arunachal Pradesh, S Assam hills), EC Bangladesh, N Myanmar, extreme S China (S Yunnan and SW Guangxi), N Laos and Vietnam (N Annam), and possibly also S Laos.
C. c. klossi Delacour & Jabouille, 1924 – C Annam (Vietnam) and C Laos.
C. c. margaritae Robinson & Kloss, 1919 – Mt Lang Bian (C/S Annam) in Vietnam.
C. c. robinsoni Ogilvie-Grant, 1906 – extreme SW Thailand and Peninsular Malaysia.
C. c. minor Cabanis, 1851 – Sumatra and Borneo.



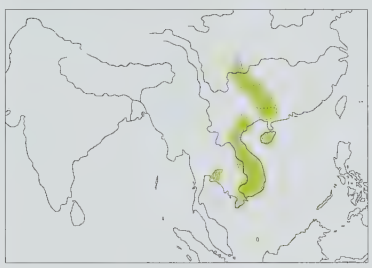
Descriptive notes. 37–39 cm; 120–133 g. Distinctive and striking green magpie with graduated long tail, slightly shaggy rear crown, rather prominent bill, nostrils concealed by soft plumes (not bristles); green, yellow and red colours of plumage bleach to, respectively, dull light blue, whitish and brown if exposed to prolonged bright sunlight. Nominate race has prominent black band from base of bill across side of head, enclosing eye and crossing under slight crest on nape; rest of head, entire body plumage, scapulars, lesser upperwing-coverts and upperside of tail grass-green to pea-green; remainder of wing reddish-chestnut, tertials prominently tipped black and white, forming "ladder" on closed wing; all tail feathers except pale-tipped central pair have black subterminal chevron and whitish tip, underside of tail appears pale with blackish band across base; with wear, plumage bleaches to light blue, with pale brown wings; iris dark brown, crimson orbital ring (in excitement can be inflated into small horn-like wattle); bill crimson to orange-red, often whitish at very tip; legs bright red to orange-red. Differs from similar *C. hypoleuca* in having relatively longer tail, bold black and white (not pale green) tertial tips, no yellow wash on underparts. Sexes similar. Juvenile is duller overall, becoming almost whitish on undertail-coverts, has bill and legs yellowish-horn, iris dull grey-brown, tail feathers relatively shorter and more pointed at tips than on adult, and tertial pattern duller with weaker dark marks. Race *minor* is similar to nominate but a little smaller; *robinsoni* is very like previous, but has larger white marks at tips of tertials; *klossi* has yellow forecrown, remainder of crown yellowish-green; *margaritae* has entire crown bright golden-yellow, prominent white spots on tertials, and longer tail (the longest within genus). Voice. Noisy; presence usually first indicated by its loud, penetrating calls, which vary in intensity of delivery. Typical is a penetrating series of high-pitched notes, often finishing with harsher note, "wi-chi-chi-chi-chao", repeated with variations. Also a scolding, hysterical, chattering "chakkakakakaaka", often followed by rising terminal note. Softer chattering phrases may be given, as well as variety of shrill whistles, often accompanied by some mimicry of calls of other birds.
Habitat. Tropical and subtropical broadleaf evergreen and mixed deciduous forests, chiefly in foothills. Favours forest borders, edges of tea and cardamom plantations and secondary forest, with shrubbery, ravines and bamboo thickets, especially along watercourses. At 600–1500 m in Malay Peninsula, up to 2100 m in Sumatra, 2075 m in Vietnam and 1200 m in Nepal.
Food and Feeding. Basically carnivorous. Diet includes beetles (Coleoptera), crickets (Orthoptera), mantises (Mantidae), small frogs, snakes, lizards and birds' eggs and nestlings; seen to enter derelict building to raid nests of Glossy Swiftlets (*Collocalia esculenta*), and to return repeatedly to nest of hornet (*Vespa*) until it was devoid of grubs. Noted also as feeding on carrion, and probably takes fruits and berries, but clarification required. Usually met with singly, in pairs or in small family parties, moving through dense undergrowth, often associating with laughingthrushes (*Garrulax*) and drongos (*Dicrurus*). These noisy mixed foraging parties move from one thicket to another, sometimes pausing to mob human observer, but rarely coming into the open to do so. Avoid crossing open country or large clearings. Despite short legs, it readily forages on ground, noisily turning over leaf litter, working its way up through shrub layer, clambering between hanging creepers, sometimes ascending to upper canopy.
Breeding. Egg-laying in Apr and May in India, Apr in Myanmar and Jan and Feb in Borneo. Solitary breeder. Nest a bowl of twigs, interwoven with leaves and rootlets, the relatively deep cup lined with soft plant materials, including mosses, usually well concealed in small tree, amid shrubbery or in bamboo; when in bamboo thicket, woven around three or more bamboo stems, typically right inside heart of thicket. Clutch 3–7 eggs, mostly 4–6; no information on incubation and fledging periods.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Generally not uncommon to locally common over main part of range; distinctly scarce in W Himalayas (Uttarakhand, in N India); not well known in its limited range in extreme S China, where it just extends into SW Guangxi and S Yunnan; few data from Sumatra, where known to occur in the Barisan range. Reliance on foothill forest could make it vulnerable to habitat destruction; bearing in mind its extensive range and its favouring of secondary forest, however, the future of this attractive magpie appears to be secure.
Bibliography. Ali (1962), Ali & Ripley (1972, 1987b), Blake & Vaurie (1962), Chen Fuguan *et al.* (1998), Delacour (1929), Dickinson *et al.* (2004), Glenister (1951), Goodwin (1986), Grimmett *et al.* (1998), Lee Kwok Shing *et al.* (2006), Lekagul & Round (1991), MacKinnon & Phillipps (1993, 2000), Madge & Burn (1994), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Sheldon *et al.* (2001), Smythies & Cranbrook (1981), Vaurie (1958a), Wells (2007).

51. Indochinese Green Magpie

Cissa hypoleuca

French: Pirolle à ventre jaune **German**: Goldbauchelster **Spanish**: Urraca Ventrigualda
Other common names: Yellow-breasted/Eastern (Green) Magpie

Taxonomy. *Cissa hypoleuca* Salvadori and Giglioli, 1885, Thu Dan Mot, Cochinchina, Vietnam.
Although often expanded to encompass *Urocissa*, present genus is distinctive in appearance of its members (the green magpies). This species forms a superspecies with *C. chinensis* and *C. thalassina*, and sometimes treated as conspecific with latter. Alternatively, races *concolor* and *jini* have sometimes been considered to represent a separate species, and *katsumatae* has likewise been treated as another full species. Five subspecies currently recognized.
Subspecies and Distribution.
C. h. jini Delacour, 1930 – SC China (S Sichuan S to S Guangxi).
C. h. concolor Delacour & Jabouille, 1928 – N Vietnam (E Tonkin, N Annam).
C. h. chauleti Delacour, 1926 – C Annam (Vietnam).
C. h. hypoleuca Salvadori & Giglioli, 1885 – SE Thailand, C & S Laos and S Vietnam (S Annam and Cochinchina).
C. h. katsumatae Rothschild, 1903 – Hainan I (S China).



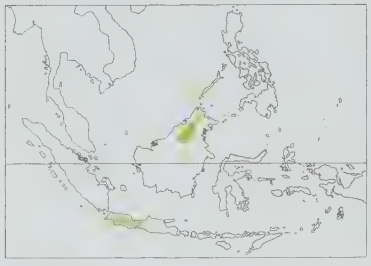
Descriptive notes. 34–35 cm; c. 125 g. Distinctive and striking green magpie with fairly long, graduated tail, slightly shaggy rear crown, rather prominent bill, nostrils concealed by soft plumes (not bristles); green, yellow and red colours of plumage bleach to, respectively, dull light blue, whitish and brown if exposed to prolonged bright sunlight. Nominate race has prominent black band running from base of bill backwards across side of head, enclosing eye and crossing under slight crest on nape; rest of head, upperparts, scapulars, lesser upperwing-coverts and upperside of tail green, remainder of wing reddish-chestnut, tertials prominently tipped pale green, outer tail feathers with black subterminal chevron and pale grey tip; throat to undertail-coverts strongly washed with lemon-yellow, darker green visible at sides of throat and breast and merging with darker green of upperparts (thus, marked contrast between upperparts and underparts); with wear, plumage bleaches to light blue, with pale brown wings; iris dark brown, crimson orbital ring (in excitement can be inflated into small horn-like wattle); bill crimson to orange-red, often whitish at very tip; legs bright red to orange-red. Differs from similar *C. chinensis* in shorter tail, tertial pattern (plain pale green spots at tips of tertials), strong yellow wash below. Sexes similar. Juvenile is duller than adult, becoming almost whitish on undertail-coverts, has bill and legs yellowish-horn, iris dull grey-brown, tail feathers relatively shorter and more pointed at tips. Races vary mainly in intensity of yellow wash on underparts and relative tail length: *chauleti* has brightest and most extensive yellow on underparts, also head lightly washed yellow, and tail (especially tips of outer feathers) washed brownish-buff; *concolor* is darker green above, paler below, with relatively weak yellow wash, and pale buff tips of tail feathers; *jini* has rather longer tail than others, is less yellowish overall, and tail feathers are tipped light buff; *katsumatae* is similar to last, but central tail feathers washed yellowish-green and tipped blue-grey (not buff), tertials tipped bluer green. Voice. Variety of calls similar to that of *C. chinensis*, although most are uttered at different pitch. High-pitched penetrating series of notes, "po-puueeee-chuk", more plaintive, less shrill, either dropping in pitch or ending on flatter note, "eeeoooeeep groak". Also gives prolonged, piercing "peeeeooo", falling in pitch, as well as a series of abrupt "weep" notes. If surprised, gives vent to high-pitched scolding chatter of alarm.
Habitat. Tropical and subtropical broadleaf evergreen and semi-evergreen forests, with bamboo thickets; to 900 m in China (to 1300 m on Hainan) and 1600 m in Vietnam. Appears to replace *C. chinensis* at lower elevations where ranges meet.
Food and Feeding. Mainly carnivorous; diet includes various insects, frogs, snakes, lizards, and contents of birds' nests. Usually singly, in pairs or in small family parties, moving through dense undergrowth, often in mixed flocks with laughingthrushes (*Garrulax*) and drongos (*Dicrurus*). Forages on ground, turning over leaf litter, and up through shrub layer, clambering between creepers; sometimes in upper canopy.
Breeding. Eggs laid in May in N Annam. Solitary breeder. Nest built by both sexes, a bowl of twigs, interwoven with rootlets, relatively deep cup lined with dry grass and feathers, typically well concealed c. 2–3 m above ground in small tree. In captivity, clutch 4 eggs, female incubated for c. 18–20 days, chicks left nest 25 days after hatching; two young successfully reared.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Not uncommon to locally common over parts of Vietnam; in Thailand rare and very localized in extreme SE, but unrecorded from adjacent Cambodia. Isolated Chinese populations near Maupin, in S Sichuan, and in Yao Shan hills of Guangxi (*jini*) and on Hainan I (*katsumatae*) must be considered under greatest threat by virtue of their isolation from other populations; however, *katsumatae* occurs in 300 km² of old-growth forest at Yinggeling, the largest continuous tract of old-growth tropical forest in China. Main range of nominate race suggests that it is locally numerous in some areas, but on the whole this is a poorly studied species that could become endangered, despite its tolerance of secondary forest. Occupation of lowland and foothill forest could make it vulnerable to habitat destruction.
Bibliography. Blake & Vaurie (1962), Chen Fuguan *et al.* (1998), Delacour (1929), Dickinson *et al.* (2004), Fuchs *et al.* (2007), Goodwin (1986), Lee Kwok Shing, Pui Lok & Li Shining (2005), Lee Kwok Shing Lau Waineng *et al.* (2006), Lei Jinyu & Liu Yang (2006), MacKinnon & Phillipps (1993, 2000), Madge & Burn (1994), Robson (2000), Vaurie (1958a).

52. Short-tailed Green Magpie

Cissa thalassina

French: Pirolle à queue courte **German**: Buschelster **Spanish**: Urraca Colicorta
Other common names: Short-tailed Magpie/Cissa; Bornean Magie (*jefferyi*)

Taxonomy. *Kitta thalassina* Temminck, 1826, Java and Sumatra.
Although often expanded to encompass *Urocissa*, present genus is distinctive in appearance of its members (the green magpies). This species forms a superspecies with *C. chinensis* and *C. hypoleuca*, and sometimes treated as conspecific with latter. Race *jefferyi* well differentiated and has been considered a separate species; further study, including molecular analysis, required. Two subspecies currently recognized.
Subspecies and Distribution.
C. t. jefferyi Sharpe, 1888 – N Borneo from Mt Kinabalu S to Mt Murud, the Usan Apau plateau and Mt Dulit.
C. t. thalassina (Temminck, 1826) – W Java.



Descriptive notes. 31–33 cm; c. 125 g. Distinctive and striking green magpie with comparatively short, bluntly graduated tail, slightly elongated rear crown feathers, rather prominent bill, nostrils concealed by soft plumes (not bristles); green, yellow and reddish colours of plumage bleach to, respectively, dull light blue, whitish and brown if exposed to prolonged bright sunlight. Nominate race has prominent black band from base of bill across side of head, enclosing eye and crossing under slight crest on nape; rest of head, body plumage, scapulars, lesser upperwing-coverts and upperside of tail light green, yellower on crown and underparts; remainder of wing reddish-chestnut, tertials pale green with narrowly black-edged paler tips, outer tail feathers with whitish tips; iris dark brown, crimson orbital ring; bill red; legs bright red to orange-red. Sexes similar. Juvenile has duller, browner bill and legs, and tail feathers more pointed than those of adult. Race *jefferyi* is darker overall than nominate, almost uniform apple-green, lacking yellow wash, has outer webs of inner two tertials chestnut, narrow black subterminal marks on outer tail feathers, and iris whitish or bluish-white with light blue orbital ring. Voice. Markedly different from those of congeners, although vocabulary of nominate race poorly documented. Voice of *jefferyi* remarkably sweet and musical at times, a series of 4 or 5 clear, incisive notes rising and falling in pitch, repeated after short pause, "swe-swi-swee-swi-swe-sweet" or "swe-si-si-swee-sweep", with variations. Also has thin, penetrating "sweeeii" and a repeated 3-note "swe-swe-gurg" or 2-note "swe-gurg".
Habitat. In Borneo found exclusively in true montane forest, from 900 m up to tree-line at 2400 m. Javan population inhabits narrow belt of submontane rainforest in foothills, at altitudes of 1000–1200 m.
Food and Feeding. Poorly studied. Recorded food items in Borneo emphasize importance of snails (Gastropoda) in diet; feeds also on variety of insects and their larvae, and suspected to have taken small frogs. Usually singly, in pairs or in small family parties, moving through dense undergrowth; forages on ground among litter, and up through shrub layer, sometimes to upper canopy. General behaviour much as that of *C. chinensis*, but noted as feeding near limit of tree-line, foraging among moss-covered twisted trunks.
Breeding. Poorly documented. Family parties reported in Apr in Borneo, suggesting egg-laying in early Feb; two young reared to fledging appears to be average family size. Cup-shaped nest built from thin twigs on layer of bigger branches, mixed with dry leaves of bamboo and grass; inner cup lined with thin blackish roots. No further information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. In Borneo (race *jefferyi*) not uncommon in higher-elevation forests of Mt Kinabalu National Park. In Java (nominate race) is not at all well known, being confined to areas of submontane rainforest between 1000 m and 1200 m in W Java, where its occurrence in Mt Halimun National Park ensures a degree of protection. As both taxa have such limited ranges and are likely to merit full species status, priority should be given to assessing their ecological requirements and populations.
Bibliography. Blake & Vaurie (1962), Davison (1992), Delacour (1929), Dickinson *et al.* (2004), Goodwin (1986), Jepson (1997), Lekagul & Round (1991), MacKinnon & Phillipps (1993), Madge & Burn (1994), Meyer (1884), Sheldon *et al.* (2001), Smythies & Cranbrook (1981), Wildash (1968).

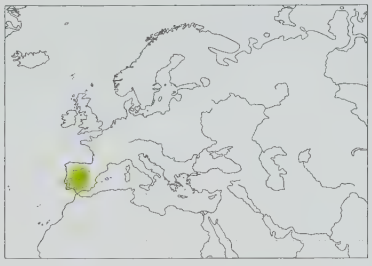
Genus *CYANOPICA* Bonaparte 1850

53. Iberian Azure-winged Magpie

Cyanopica cooki

French: Pie-bleue ibérique **German**: Blauelster **Spanish**: Rabilargo Ibérico
Other common names: Cook's/Spanish Azure-winged Magpie

Taxonomy. *Cyanopica cooki* Bonaparte, 1850, Madrid, Spain.
Recent DNA-sequencing indicates that this genus and *Perisoreus* form unique clades, separate from other corvids; significance of this requires further research. Usually treated as conspecific with *C. cyanus*. Because of peculiar global distribution of genus, with population in SW Europe (Iberia) separated by 9000 km from only other one (in E Asia), it was long speculated that Iberian population could have arisen from birds brought back E by Portuguese merchants and sailors in 16th/17th centuries; fossilized remains of this species found recently in caves on Gibraltar, however, indicate that distribution natural, which suggests that the populations had been separated during last glaciation. Further, two independent DNA studies of genus indicated that the two forms diverged at least one million years ago, and should therefore be treated as two species. Clarification of vocal differences from *C. cyanus* required. Birds of N part of interior Spain tend to be slightly larger and greyer than those of coastal areas, and could perhaps represent a geographical race (for which the name *gili* is available); overall variation is, however poorly defined. Treated as monotypic.
Distribution. Spain (except N & E) and E & S Portugal.
Descriptive notes. 34–36 cm; 65–76 g. Unmistakable within its range, where combination of black hood, greyish-brown mantle and blue wings and tail distinctive; head relatively large, slightly ruffled on nape, wings relatively short and broad, long tail quite broad and strongly graduated, bill rather small and pointed, nasal tufts short and dense, legs relatively short and not very sturdy. Has black hood down to below eye, ear-coverts and nape, glossed purplish on crown and nape, contrasting with white throat and malar region, highlighting very narrow pale collar on lower nape bordering hood; upperparts to uppertail-coverts grey-brown, tinged pinkish, uppertail-coverts also washed



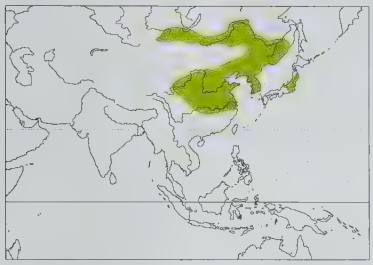
blue; upperwing blue (cerulean or azure), remiges with inner web dull black, outer web azure-blue, white tip to outer web of primaries, increasing in extent outwards towards outermost primaries; tail uniform cerulean or azure-blue with horn-coloured feather shafts; underparts pinkish-grey, rather darker on side of breast and flanks, shading to almost white on central belly; iris dark brown to black; bill and legs black. Differs from very similar *C. cyanus* in smaller size, relatively shorter bill, somewhat brighter blue wings and tail, and lack of white tips on tail. Sexes similar. Juvenile is similar to adult, but hood brownish-black, crown feathers with pale fringes, wing-coverts with sandy fringes, greater coverts tipped white (forming narrow bar), tail tip blunter and with narrow buff fringe; like adult by end of first autumn. Voice. Typical call a hoarse, rising "zschreee", seemingly a little more rasping than that of *C. cyanus*, this and various rattling calls often repeated as birds move through bushy cover; some rattling calls more prolonged than those of *C. cyanus*, reminiscent of Mistle Thrush (*Turdus viscivorus*) call. Also variety of single-note calls with varying emphasis, and in alarm a loud "kree-kree-kree". Subdued chattering by male in display to female.
Habitat. Open woodland with grassy clearings, including orchards and olive (*Olea*) groves. Prefers oak woodland, especially holm oak (*Quercus rotundifolia*) and cork oak (*Quercus suber*) with scattered stone pines (*Pinus pinea*). Stands of introduced eucalypts (*Eucalyptus*) particularly favoured as communal roost-sites. Recorded locally to 700 m in foothill gorges; occurs down to sea-level, with largest concentrations in coastal wooded dunes of planted stone pines in SW Spain, one of the few habitats (albeit a somewhat artifical one) that allow it to compete successfully with normally dominant *Pica pica*.
Food and Feeding. Omnivorous. Takes wide variety of food items, especially beetles (Coleoptera) and other insects and their larvae, including hairy caterpillars, also millipedes (Diplopoda), snails (Gastropoda), leeches (Hirudinea); also quite a number of fruits and nuts, including grapes, olives, mulberries, myrtle, asparagus, cherries, daphne, acorns and pine seeds. Forages in small to quite large groups, moving from tree to tree in follow-my-leader manner. On reaching feeding site, some flock-members investigate tree canopy, examining foliage for insects and fruits, even hanging upside-down; others drop to the ground, hopping about as they turn over leaf litter and examine tree boles. Stores food items in caches in loose soil of banks. Generally shy and very wary, but can become confiding where unmolested. General behaviour very much as for *C. cyanus*.
Breeding. Laying from early Apr to late May, but at higher elevations in C Spain (1250 m) peak in mid-Jun. Believed to have monogamous pair-bond, pair-members keep together within flocks. Social breeder, forming loose colonies, but rarely more than one nest in a single tree. Helpers, presumed young from previous year, work with parents to feed nestlings. Nest construction mostly by female, although male brings material to site and helpers often participate, work taking 10–18 days; nest a foundation of twigs, with thick layer of mud or dung, topped by layer of soft plant material, wool and animal fur as main lining of cup, built 3–7 m above ground around fork in outer branch, usually in mid-canopy, as far as possible from main trunk. Clutch 4–9 eggs, usually 5–7; incubation by female alone, period 15–16 days; chicks fed by both parents, often by helpers as well, nestling period c. 14–16 days; family-members keep together within confines of flock. Nests parasitized by Common Cuckoo (*Cuculus canorus*) and Great Spotted Cuckoo (*Clamator glandarius*).
Movements. Basically sedentary; occasional reports from NE Spain and extreme SW France suggest that some individuals disperse farther than was previously thought.
Status and Conservation. Not assessed. Hitherto treated as race of *C. cyanus*. Recent population estimates suggest c. 40,000 pairs in Portugal and c. 250,000 pairs in Spain. A report of breeding in SW France remains unsubstantiated. Although most abundant in the S Spain–Portugal border regions, and said to be increasing in Portugal, it seems that total population could be declining. Destruction of extensive stands of holm oaks has been blamed for its disappearance over several areas; competition with increasing numbers of *Pica pica* has also been suggested as possible reason for local decreases, and it seems that, in places where one species is numerous, the other is excluded. Older records mention flocks of up to 300 individuals during late 1930s and early 1940s; such numbers not seen today.
Bibliography. Alarcos *et al.* (2007), Alonso *et al.* (1991), Cooper (1998), Cooper & Voous (1999), Cramp & Perrins (1994), de la Cruz (1988), Dos Santos (1968), Ferrer (1987), Goodwin (1975, 1986), Hagemeijer & Blair (1997), Madge & Burn (1994), Martí & del Moral (2003), Purroy (1997), Rooke (1999), Sacarrão (1974), Valencia (2002), Valencia, de la Cruz & Carranza (2000, 2004), Valencia, de la Cruz, Carranza & Solis (2005), Valencia, de la Cruz & González (2003), Vaurie (1959).

54. Asian Azure-winged Magpie

Cyanopica cyanus

French: Pie-bleue à calotte noire **German**: Azurelster **Spanish**: Rabilargo Asiático

Taxonomy. *Corvus cyanus* Pallas, 1776, Dauria = Transbaikalia (southern Siberia), Russia.
Recent DNA-sequencing indicates that this genus and *Perisoreus* form unique clades, separate from other corvids; significance of this requires further research. Usually treated as conspecific with *C. cooki*, but fossilized remains of latter (previously thought introduced) indicate that its distribution is natural; also, DNA studies of genus indicated that the two forms diverged at least one million years ago, and should be treated as separate species; clarification of vocal differences required. Geographical variation partly clinal, intergrading of mainland races making assessment tricky; validity of *koreensis*, *stegmanni*, *swinhoei* and *kansuensis* perhaps questionable. Other proposed races are *tristis* (described from near Chita, in Transbaikalia) and *pallescens* (from Radde, on R Amur, in extreme SE Russia), both synonymized with nominate, and *jeholica* (C Jehol, in NE China), treated as synonym of *interposita*. Seven subspecies tentatively recognized.
Subspecies and Distribution.
C. c. cyanus (Pallas, 1776) – NW & N Mongolia (E from Uliastay) E across Transbaikalia and S Yakutia to SE Russia (Amurland and Ussuriland), S to NE China (N Heilongjiang).
C. c. japonica Parrot, 1905 – C Japan (N & C Honshu).
C. c. stegmanni Meise, 1932 – S Heilongjiang (NE China).
C. c. koreensis Yamashina, 1939 – Korean Peninsula.
C. c. kansuensis Meise, 1937 – NC China (NE Qinghai, W Gansu and NW Sichuan).
C. c. interposita E. J. O. Hartert, 1917 – N China from Ningxia and E Gansu and Shaanxi E to Hebei and Shandong.
C. c. swinhoei E. J. O. Hartert, 1903 – EC & E China (N & C Sichuan E to Zhejiang and Jiangxi).



Descriptive notes. 36–38 cm; male 80–118 g, female 76–112 g. Unmistakable within its range, where combination of black hood, greyish mantle and blue wings and tail distinctive; head relatively large, slightly ruffled on nape, wings relatively short and broad, long tail quite broad and strongly graduated, bill rather small, slim and pointed, nasal tufts short and dense, legs relatively short and not very sturdy. Nominate race has black hood down to below eye, ear-coverts and nape, shiny black on crown and nape, contrasting white throat and malar region, highlighting very narrow pale collar on lower nape bordering hood; upperparts dull greyish (becoming paler but browner towards E), upperwing powder-blue, primaries with extensive black-edged white, chiefly on outer webs (distinct panel), and notches at tips, tail blue with brownish feather shafts, central rectrices with large white tips; underparts whitish with sandy-grey wash; iris dark brown to black; bill and legs black. Sexes similar. Juvenile is similar to adult, but hood browner, crown feathers with pale fringes, wing-coverts with sandy fringes, greater coverts tipped white (narrow bar), tail with ill-defined pale tips; like adult by end of first autumn. Races differ mainly in size and colour intensity: *stegmanni* is darker and greyer in body colour than nominate; *koreensis* is whiter below and browner above; *interposita* is a grey form, darker than *stegmanni*; *swinhoei* is similar to last but browner; *kansuensis* is greyish above, creamy whitish below, and has smaller bill than others; *japonica* is smaller and darker, with brighter blue wings and tail. Voice. Some apparent poorly understood geographical variation in certain calls. Typical call a shivery trilled, rising "screeep", often repeated as contact when birds moving through shrubbery. In general, vocalizations seem very much like those of *C. cooki* when compared with these regional variations. For race *swinhoei*, however, rattle has been described as slow and creaky, ending in high-pitched "keeow", latter reminiscent of call of *Corvus monedula*.

Habitat. Lowland thickets, especially mixed willow (*Salix*) and *Prunus* thickets with large mature deciduous trees on riverine islands; also parks (even in city centres) and overgrown gardens. Avoids dense forest and mountain slopes, but often in wooded farmland, orchards and broken deciduous and mixed woodland. From sea-level to 1600 m.

Food and Feeding. Omnivorous. Takes wide variety of food items, especially insects and their larvae, and quite a number of fruits and nuts. In Ussuriland, feeds chiefly on fruits, spiders (Araneae) and insects in spring, almost entirely spiders and insects in summer, fruits and berries in autumn, and, in winter, invertebrates found in leaf litter, galls, bark, fishermen's baits and carrion. Forages in small to, sometimes, quite large flocks (up to several 100 individuals), which move from tree to tree in follow-my-leader style; upon reaching a fresh feeding site, flock loosens up, some individuals investigating tree canopy, examining foliage for insects and fruits, even hanging upside-down in the process, while others descend to ground, where they hop around, tail raised, as they turn over leaf litter and examine tree boles. Stores food items, mostly acorns and pine (*Pinus*) seeds, in caches in loose soil. Apparently shy and wary over most of range; can become remarkably confiding in city parks and edges of villages, where it forages for scraps or raids rubbish dumps and litter bins.

Breeding. Egg-laying May–Jun, peak in second half of May in SE Russia (Ussuriland) and Japan. Believed to have monogamous pair-bond, as pair-members seem to keep together within flocks. Social breeder, forming loose colonies; nests on average 15–20 m apart, rarely more than one in any one tree. Helpers, presumed young from previous year, work with parents to feed nestlings. Nest built mostly by female, male brings material to site, helpers often participate, construction work takes 10–18 days; nest a mass of twigs and rootlets, often domed by naturally amassed twigs (such as would form after floodwater had receded), deep cup lined with soft plant material, particularly animal fur, placed inside outer foliage of long branch and rarely more than 2 m above ground, sometimes at ground level itself, or exceptionally as high as 15 m and frequently in tree hollow. Clutch 5–8 eggs, usually 6 or 7; incubation by female alone, period 15–16 days; chicks fed by both parents, often also by helpers, nestling period 16–19 days; in early Jul young gather in small flocks for a few weeks, many disperse as they meet up with other flocks from adjoining territories, later the adults join remaining, and additional, young and prepare for winter; in regions where winter dispersal unusual, family groups tend to keep together within local flock. Nests parasitized by Common Cuckoo (*Cuculus canorus*).

Movements. Most populations basically resident. In Ussuriland disperses in winter, turning up in open country and even on inshore islands, some reaching N Heilongjiang (NE China); no such movements recorded in Japan in winter, although may descend 1–2 km following heavy snowfall.

Status and Conservation. Not globally threatened. Widespread and locally common. Throughout its wide range can be relatively inconspicuous, its colonial habits also making it seem scarcer than it really is, particularly in W of range, where populations particularly fragmented. In E Siberia and China, considered common over much of its range in appropriate habitats. In Japan, widespread over C Honshu, but more localized in N Honshu; formerly occurred on Shikoku, but no recent reports from that island, and was widespread also on Kyushu, but last reported there in 1968; these localized extinctions have been blamed on competition with introduced *Pica pica*. Attempted introduction in Hong Kong was unsuccessful.

Bibliography. Austin & Kuroda (1953), Brazil (1991), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1976), Coombs (1978), Cramp & Perrins (1994), de la Cruz (1988), de la Cruz *et al.* (1990), David & Gosselin (2002a), Dementiev *et al.* (1954, 1970), Goodwin (1986), Hosono (1966a, 1966b, 1967a, 1967b, 1969, 1971, 1975, 1983, 1989), Hubenthal (1992), MacKinnon & Phillipps (2000), Madge & Burn (1994), Stepanyan (2003), Tomek (2002), Ueta (1994a, 1994b, 1998, 1999, 2001), Vaurie (1959), Yamagishi & Fujioka (1986).



PLATE 34

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cm 15

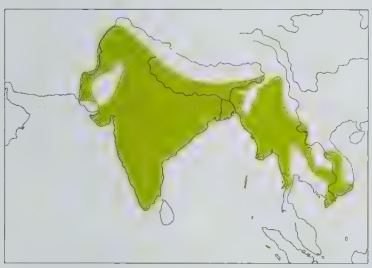
Genus *DENDROCITTA* Gould, 1833

55. **Rufous Treepie**

Dendrocitta vagabunda

French: Témia vagabonde **German**: Wanderbaumelster **Spanish**: Urraca Vagabunda
Other common names: (Indian) Treepie

Taxonomy. *Coracias vagabunda* Latham, 1790, Calcutta, India.
Formerly known as *D. rufa*. Perhaps has a distant relationship with *D. frontalis*. Recent investigations of type specimens have revealed that proposed name *vernayi* (hitherto used for SE Indian population, based on birds from Nallamalai Range, in S Kurnool) is a junior synonym of *pallida*; type locality of latter (originally given erroneously as W Himalayas) has been fixed to Chennai (in Tamil Nadu), and *behni* is a new name for W Indian population that formerly went under name *pallida*. Geographical variation clinal, races intergrading; some of listed races possibly of questionable validity. Nine subspecies tentatively recognized.
Subspecies and Distribution.
D. v. bristoli Paynter, 1961 – E Pakistan (S to Karachi) and E in Himalayan foothills to N India (Dehra Dun, in Uttarakhand).
D. v. vagabunda (Latham, 1790) – Uttarakhand E to Bangladesh and NE India, S in peninsula to N Andhra Pradesh.
D. v. behni Steinheimer, 2009 – W & C India from S Gujarat (E Surat District) S to C Karnataka and E to mountain ridges of E Western Ghats.
D. v. parvula Whistler & Kinnear, 1932 – SW India (S Karnataka and Kerala).
D. v. pallida (Blyth, 1846) – SE India S from Eastern Ghats (S of R Godavari).
D. v. sclateri Stuart Baker, 1922 – W & N Myanmar.
D. v. kinneari Stuart Baker, 1922 – C & E Myanmar, S China (SW Yunnan) and NW Thailand.
D. v. saturatior Ticehurst, 1922 – S Myanmar and SW Thailand.
D. v. sakeratensis Gyldenstolpe, 1920 – C, E & SE Thailand, Cambodia, S Laos and C & S Vietnam.



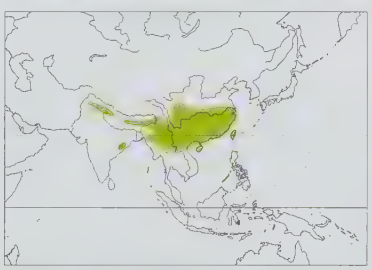
Descriptive notes. 46–50 cm; 90–130 g. Distinctive large treepie with long, strongly graduated tail, central feather pair somewhat broadening towards tip, rather short bill with strongly curved culmen and cutting edges. Nominate race has entire head to breast and upper mantle sooty blackish, blackest on face and throat; upperparts ginger-brown, paling to orange-buff on uppertail-coverts; secondary upperwing-coverts and tertials silvery grey, contrasting with black of rest of wing; central tail feathers light silvery grey, shading paler towards tip, and ending in wide black terminal band, remainder of tail feathers similar but progressively shorter, outermost (shortest) with terminal half black; lower underparts buffy rufous, paling to orange-buff on undertail-coverts; iris red or reddish-brown; bill and legs blackish-grey. Sexes similar. Juvenile has hood and mantle uniformly brown, rump, uppertail-coverts and underparts creamy buff, black areas of wings browner than adult and wingpanel pale grey with rusty-cream tinges, tail feathers (except central pair) with narrow rusty tips; first-year aged by retained worn, brown primaries. Races vary mainly in size and colour saturation, but complicated by clinal intergrading: *bristoli* is largest and longest-tailed, close to nominate in colour; *behni* is second largest and rather paler than previous, with greyish-buff belly and vent, ochre-buff mantle and scapulars, and cinnamon rump; *parvula* is smallest and most richly coloured race, with dark rufous-brown upperparts; *pallida* is similar in size to nominate, colours are paler but brighter, with belly almost creamy buff; *sclateri* has darker upperparts than nominate, nape and mantle colours diffusing; *kinneari* is similar to previous, but darker; *saturatior* is a little smaller and the darkest of all, with very dark reddish-brown upperparts; *sakeratensis* resembles nominate, but has darker nape. Voice. Advertising call difficult to describe, but one of most familiar sounds of Indian countryside, a loud, ringing, almost metallic "ko-kí-la"; another frequently heard call is a raucous chatter, similar to that of *Pica pica* but harsher and slower in delivery. Otherwise has wide vocabulary of various harsh notes, squawks and musical sounds, many of which shared by congeners.
Habitat. Open deciduous woodland of all kinds, from dry forest to moist broadleaf woodlands. Open agricultural country with scattered trees, town and city parks, large gardens and the like. Chiefly in lowlands, also in low hills, ascending as high as 2100 m.
Food and Feeding. Omnivorous, but primarily carnivorous. Recorded items include large variety of insects and their larvae, such as crickets and grasshoppers (Orthoptera), beetles (Coleoptera), moths (Lepidoptera), wasps and ants (Hymenoptera) and termites (Isoptera), also spiders (Araneae), centipedes (Chilopoda) and snails (Gastropoda); equally diverse variety of small vertebrates, including contents of bird nests, small birds, small rodents, small bats, small snakes, frogs and lizards. Recorded as killing sickly small birds, e.g. Indian Robin (*Saxicoloides fulicatus*), Common Tailorbird (*Orthotomus sutorius*), Oriental White-eye (*Zosterops palpebrosus*) and Purple Sunbird (*Cinnyris asiaticus*), and seen to tear open nests of weaver-birds to reach contents. Scavenges about villages for kitchen waste; feeds on carrion (roadkills), and even scavenges at tiger (*Panthera tigris*) kills. Very fond of wild figs (*Ficus*), including banyan and peepul, and variety of other fruits including neem (*Melia*) and the poisonous *Trichosanthes palmata*; raids orchards for cultivated fruits, especially figs, also mulberries and papaya. Visits flowering *Bombax* and *Erythrina* trees for nectar at appropriate season. Can be remarkably confiding about tourist attractions, even taking food from the hand at picnics. Usually in pairs or small family groups, although larger gatherings at exceptional food sources, such as swarming winged termites. Readily follows mixed-species groups of larger forest birds, especially Greater Racquet-tailed Drongos (*Dicrurus paradiseus*) and various woodpeckers (Picidae), nimbly catching moths or other insects disturbed from tree trunks or leaf litter by those species. Rides on backs of both domestic and wild large mammals, feeding on ectoparasites and anything that may be disturbed from underfoot. Forages on ground, with tail held raised, moving in short hops.
Breeding. Season varies according to rains, generally Mar–Jul, but mostly May–Jun in N India and Mar–Apr in S (Kerala). Solitary breeder. Nest built by both sexes, rather small for size of bird, a flimsy cup of thin, usually thorny twigs, lined with rootlets and smaller twigs, typically 6–8 m above ground, often in quite exposed position in often isolated or prominent tree such as sheesham (*Dalbergia*), acacia (*Acacia*), mango (*Mangifera*) or salai (*Boswellia*). Both sexes build nest, feed young, and are said to share incubation but this requires confirmation. Clutch 2–6 eggs, usually 4 or 5 (average in India larger in N than in S); incubation said to shared by sexes, but confirmation required; both parents feed the young; no information on duration of incubation and nestling periods.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Generally common and widespread throughout most of range; quite localized and uncommon in E, e.g. in Vietnam. The treepie most likely to be encountered in semi-open country, dry forest and farmland over most of Indian Subcontinent. A very adaptable species, omnivorous, and successful in its survival strategies of living alongside humans. Although reported as causing some damage to orchards and cereal crops, its diet includes high percentage of insects, many of which are detrimental to food crops; seems likely that any harm that it does is far outweighed by the quantity of insect pests that it consumes.
Bibliography. Ali & Ripley (1972, 1987b), Chen Fuguan *et al.* (1998), Dickinson *et al.* (2004), Goodwin (1986), Grimmett *et al.* (1998), Lekagul & Round (1991), Madge & Burn (1994), Paynter (1961), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Robson (2000), Steinheimer (2009), Stuart Baker (1928), Thomas & Poole (2003), Vaurie (1958a), Whistler (1949), Zafar-Ul-Islam *et al.* (2001).

56. **Grey Treepie**

Dendrocitta formosae

French: Témia de Swinhoe **German**: Graubrust-Baumelster **Spanish**: Urraca Gris
Other common names: Himalayan Treepie

Taxonomy. *Dendrocitta sinensis* var. *formosae* Swinhoe, 1863, Taiwan.
Forms a species group with *D. cinerascens*, *D. occipitalis* and *D. leucogastra*; sometimes thought to be conspecific with first two. Races fall into two groups, W group with greyish rump and some grey in tail (*occidentalis*, *himalayana*, *sarkari*, *assimilis*) and relatively shorter-tailed E group with darker, less patterned plumage, white rump and (except nominate) wholly black tail (*sinica*, *sapiens*, *insulae*, nominate). Isolated race *sarkari* often subsumed in *himalayana*. Race *himalayana* often listed as "*himalayensis*", but former has priority. Eight subspecies recognized.
Subspecies and Distribution.
D. f. occidentalis Ticehurst, 1925 – Himalayan foothills from Pakistan (Murree) E through NW India to W Nepal.
D. f. himalayana Jerdon, 1864 – C Nepal E to NE India, N Myanmar, S China (S Yunnan), NW Thailand, N & C Laos and N Vietnam (S to N Annam).
D. f. sarkari Kinnear & Whistler, 1930 – Eastern Ghats (Orissa and N Andhra Pradesh), in E India.
D. f. assimilis Hume, 1877 – SW & E Myanmar and N Thailand.
D. f. sapiens (Deignan, 1955) – C China (WC Sichuan).
D. f. sinica Stresemann, 1913 – E & SE China and NE Tonkin (extreme N Vietnam).
D. f. formosae Swinhoe, 1863 – Taiwan.
D. f. insulae E. J. O. Hartert, 1910 – Hainan I, in S China.



Descriptive notes. 36–40 cm; 89–121 g. Rather drab brownish-grey treepie with long, strongly graduated tail, central feather pair somewhat broadening towards tip, rather short bill with strong curve on culmen and cutting edges. Nominate race has forehead and side of crown blackish-brown, blackest on forecrown and above eye, shading lighter on rear ear-coverts and to breast, remainder of crown and nape light grey, becoming brownish on mantle; upperparts dark brown, lower rump and uppertail-coverts greyish-white; upperwing black, white bases of primaries (white patch); tail black, basal third of central feather pair pale grey; breast brownish-grey, shading paler on lower underparts, undertail-coverts chestnut; iris red or reddish-brown; bill and legs blackish-grey. Sexes similar. Juvenile is more uniformly grey-brown (little contrast between darker face and body colour), black areas of wings browner than when adult, tail (except central pair) with narrow rusty tips. Races differ mainly in size, rump and tail colour, and colour saturation, but complicated by intergrading between most forms: *sinica* is darker, less brown, than nominate, tail wholly black; *sapiens* is like previous but darker; *insulae* is slightly smaller and duller than *sinica*, with smaller white wing patch; *himalayana* has longer tail than previous races, is more tawny-brown above, rump and uppertail-coverts pale grey, central rectrices pale silvery grey, shading paler towards tip and with wide black terminal band, rest of tail feathers similar but progressively shorter, outermost almost entirely black; *occidentalis* is like previous, but on average larger; *sarkari* has smaller bill than *himalayana*; *assimilis* also is on average smaller, has stouter bill, relatively shorter tail and drabber underparts. Voice. Advertising call, typical of most treepie species, a loud, ringing, almost metallic, stumbling "klok-kli-klok-kli-kli…", uttered with explosive, undulating rhythm. Otherwise has wide vocabulary of various rattles, barks, burps, squawks, and various laughing and musical sounds.
Habitat. Deciduous montane woodland of all kinds, from tropical evergreen forest in foothills to oak–rhododendron (*Quercus–Rhododendron*) forest at higher elevations. Not fond of dense forest, but tolerates scrubby hillsides with scattered large trees; seems to prefer forest edge and clearings about villages, terraced slopes and wooded valleys. In S of range chiefly between 800 m and 2300 m; down to 550 m in China.
Food and Feeding. Very similar to *D. vagabunda*. Omnivorous, but primarily carnivorous. Prey items include large variety of invertebrates and their larvae, such as grasshoppers (Orthoptera), beetles (Coleoptera), moths (Lepidoptera), spiders (Araneae) and centipedes (Chilopoda); some small vertebrates, including lizards and small birds, and eggs and nestlings of small birds. Variety of fruits and seeds also taken, and very fond of nectar from flowering trees and shrubs such as *Bombax*, *Erythrina* and *Rhododendron*. Scavenges around villages for kitchen waste. Also raids

On following pages: 57. Bornean Treepie (*Dendrocitta cinerascens*); 58. Sumatran Treepie (*Dendrocitta occipitalis*); 59. White-bellied Treepie (*Dendrocitta leucogastra*); 60. Andaman Treepie (*Dendrocitta bayleii*); 61. Collared Treepie (*Dendrocitta frontalis*); 62. Racquet-tailed Treepie (*Crypsirina temia*); 63. Hooded Treepie (*Crypsirina cucullata*); 64. Ratchet-tailed Treepie (*Temnurus temnurus*); 65. Common Magpie (*Pica pica*); 66. Arabian Magpie (*Pica asirensis*); 67. Yellow-billed Magpie (*Pica nuttalli*); 68. Black-billed Magpie (*Pica hudsonia*).

orchards for cultivated fruits, especially figs (*Ficus*), mulberries (*Morus*) and the like. Forages in pairs or small family groups; also larger gatherings of up to 20 individuals at exceptional food sources, such as fruiting figs or swarming termites (Isoptera). Readily follows mixed-species groups of larger forest birds, especially laughingthrushes (Timaliidae), for insects flushed by the flock moving through undergrowth. Briefly and clumsily hovers in canopy to reach fruits. Spends most of time in trees, but often feeds on ground, hopping about, with raised tail; often in open on terraced hillsides as it feeds on fallen grain.

Breeding. Season varies according to rains, generally Apr–Jul, but mostly May–Jun in N India and Myanmar. Solitary breeder. Nest built by both sexes, rather small for size of bird, a flimsy cup of thin sticks, shallow cup lined with rootlets and other soft plant material, placed 2–6 m above ground, sometimes in quite exposed position, inside canopy of small tree or shrub or in stand of bamboo, sometimes virtually on ground. Clutch 3–5 eggs, usually 3 or 4; incubation said to be shared by sexes, but this requires confirmation; both sexes feed young; no information on duration of incubation and fledging periods.

Movements. Sedentary.

Status and Conservation. Not globally threatened. Generally common and widespread throughout most of range; quite localized and uncommon towards W limits, e.g. in Pakistan and Kashmir. Although reported to cause some damage to orchards and cereal crops, its omnivorous diet includes a high percentage of insects, many of which would be detrimental to food crops; seems likely that any harm done is far outweighed by amount of insect pests that it consumes.

Bibliography. Ali (1949, 1962), Ali & Ripley (1972, 1987b), Chen Fuguan *et al.* (1998), Dickinson *et al.* (2004), Goodwin (1986), Grimmett *et al.* (1998), Lekagul & Round (1991), Liu Yang & Lei Jinyu (2005), Madge & Burn (1994), Owen (2003), Paynter (1961), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Robson (2000), Stuart Baker (1928), Vaurie (1958a), Whistler (1924).

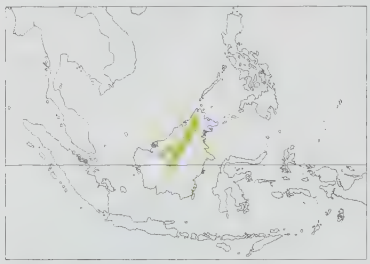
57. **Bornean Treepie**

Dendrocitta cinerascens

French: Témia de Bornéo **German**: Borneobaumelster **Spanish**: Urraca de Borneo
Other common names: Sunda/Malaysian Treepie (when treated as conspecific with *D. occipitalis*)

Taxonomy. *Dendrocitta cinerascens* Sharpe, 1879, Mount Kinabalu, northern Borneo.
Forms a species group with *D. formosae*, *D. occipitalis* and *D. leucogastra*. Often treated as conspecific with *D. occipitalis*, and sometimes *D. formosae* included in same species. Monotypic.

Distribution. Mountains of N & C Borneo.



Descriptive notes. 40 cm; c. 125 g. Distinctive treepie with mostly pale face and throat, long, strongly graduated tail, central feather pair broadening somewhat towards tip (but a little narrower than in *D. formosae*), short bill with strong curve on culmen and cutting edges. Forehead, nasal tuft and lores rufous-buff; variable chocolate-brown bar over forecrown; mid-crown pale grey, almost white, shading to pale grey on nape, on hindneck becoming rufous-buff with light grey wash, often stronger grey on scapulars, mantle and back, narrow whitish line along outer scapulars, outlining wing; rump and uppertail-coverts very pale grey, almost white; upperwing black, white patch at base of primaries; central tail feathers light silvery grey with wide black terminal band, remainder of tail feathers black; most of face, throat, side of head and entire underparts rufous-buff, deeper orange-buff or ochraceous-buff on undertail-coverts; iris red or reddish-brown; bill and legs blackish-grey. Sexes similar. Juvenile has buffy fringes on body feathers and tertials, narrower central tail feathers; first-year aged by retained worn (brown) juvenile primaries and retained narrower tail feathers. Voice. Variety of typical treepie squawks, bell-like clangs, and other metallic and musical notes (which account for large percentage of bird sounds of Bornean hill forests). All call phrases shorter than those of *D. formosae*, and all rather explosive in delivery: a metallic clang sounding like old motor horn, "kil-awk"; a raucous squawk followed by metallic clunk, "squaaaaaak-tonk"; a metallic note followed by a ringing fading resonance, "b-clunk-eeeee"; and a liquid note followed by two harsh calls, "plonk, grah-grah". Also reported are a harsh chatter like that of *Pica pica*, and mimicry of other forest sounds.

Habitat. Hill and mountain forests, both primary and secondary; especially scrub-jungle, bamboo thickets, edges of villages and associated cultivation. Particularly in foothill valley forests. At 300–2600 m.

Food and Feeding. Omnivorous, primarily carnivorous. Prey items include large variety of invertebrates and their larvae, such as grasshoppers (Orthoptera), beetles (Coleoptera), moths (Lepidoptera), cockroaches (Blattodea). Variety of fruits and seeds also taken, including rice and fallen grain. Scavenges for food scraps around villages, and on Mt Kinabalu follows walkers for picnic scraps. Very sociable, typically found in noisy parties in tree canopy, but forages at all levels; often descends to ground, where it hops rather awkwardly, with raised tail.

Breeding. Little information. Eggs found early Jan to mid-Mar. Believed to be solitary breeder. Nest a shallow construction of fine twigs, cup lined with rootlets and other soft plant material, typically not very well hidden inside canopy of small tree or tall shrub. Clutch usually 2 eggs. No other information.

Movements. Sedentary.

Status and Conservation. Not assessed. Probably not globally threatened. Seems to be generally common and widespread throughout range in N & C Borneo. Oddly, is absent from hill forests of the Poi Range, Penrissen, and Kapuas and Mahakam drainage systems. Its tolerance, in some areas perhaps even its preference, for secondary forests bodes well for the future survival of this species.

Bibliography. Davison (1992), Dickinson *et al.* (2004), Goodwin (1986), MacKinnon & Phillipps (1993), Madge & Burn (1994), Sharpe (1879, 1889), Sheldon *et al.* (2001), Smythies & Davison (1999), Vaurie (1958a).

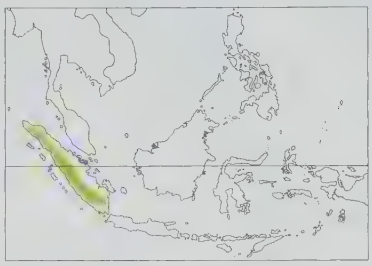
58. **Sumatran Treepie**

Dendrocitta occipitalis

French: Témia coiffée **German**: Sumatrabaumelster **Spanish**: Urraca de Sumatra
Other common names: Sunda/Malaysian Treepie (when treated as conspecific with *D. cinerascens*)

Taxonomy. *Glaucopis occipitalis* S. Müller, 1836, Sumatra.
Forms a species group with *D. formosae*, *D. cinerascens* and *D. leucogastra*. Often treated as conspecific with *D. cinerascens*, and sometimes *D. formosae* included in same species. Monotypic.

Distribution. Sumatra.



Descriptive notes. 40 cm; 88–102 g. Distinctive treepie with long, strongly graduated tail, central pair of feathers somewhat broadening towards tip, rather short bill with strongly curved culmen and cutting edges. Has forecrown, face, throat and side of head liver-brown, darkest on crown, contrasting white upper nape, shading into light grey lower nape; upperparts tawny-brown, rump and uppertail-coverts pale grey (almost whitish); upperwing black, white patch at base of primaries; central tail feathers light silvery grey with wide black terminal band, remainder of tail black; lower throat dark brown fading to buffy rufous on breast and belly, becoming richer tawny-orange on undertail-coverts; iris red or reddish-brown; bill and legs blackish-grey. Sexes similar. Juvenile has crown, face and throat more sooty than adult, buffy fringes on body feathers and tertials, and narrower central tail feathers; first-year aged by retained worn (brown) juvenile primaries and retained narrower tail feathers. Voice. Little information. Said to be noisy, uttering bell-like calls. Vocalizations probably very much as *D. cinerascens*, which is similar vocally to other treepies.

Habitat. Hill and mountain forests, both primary and secondary; also tolerates coniferous forest, bamboo stands in gulleys, and plantations. Generally between 400 m and 2300 m.

Food and Feeding. Little specific information; this species was for long regarded as conspecific with *D. cinerascens*, and division of data between the two taxa confused. Often perches quite low down, waiting for movements in undergrowth which may flush insects from leaf litter. Also feeds in upper canopy of trees, its methodical searching reminding some observers of a malkoha (*Phaenicophaeus*). Usually in pairs or small family groups, although larger gatherings at exceptional food sources, such as swarming winged termites (Isoptera).

Breeding. No specific information.

Movements. Sedentary.

Status and Conservation. Not assessed. Probably not globally threatened. Seems to be generally common and widespread throughout range. Tolerance of secondary forests bodes well for the future survival of this species.

Bibliography. Dickinson *et al.* (2004), Goodwin (1986), MacKinnon & Phillipps (1993), Madge & Burn (1994), van Marle & Voous (1988), Paynter (1961), Vaurie (1958a).

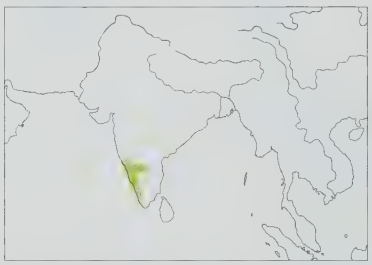
59. **White-bellied Treepie**

Dendrocitta leucogastra

French: Témia à ventre blanc **German**: Weißbauch-Baumelster **Spanish**: Urraca Ventriblanca
Other common names: Southern Treepie

Taxonomy. *Dendrocitta leucogastra* Gould, 1833, "Eastern Asia" = Malabar coast, India.
Forms a species group with *D. formosae*, *D. cinerascens* and *D. occipitalis*. Monotypic.

Distribution. Western Ghats from N Karnataka S to S Kerala and E to W Tamil Nadu (Nilgiris), in SW India.



Descriptive notes. 45 cm; c. 125 g. Unmistakable treepie with much white in plumage; long, strongly graduated tail, central pair of feathers somewhat broadening towards tip; rather stout bill with strong curve on culmen and cutting edges. Most of crown, side of head, throat and upper breast are black, rear crown, nape, hindneck and most of underparts below breast strikingly white, feathered portion of tibia black, undertail-coverts chestnut; mantle, back and scapulars chestnut-brown, rump and uppertail-coverts white; upperwing black, white patch at base of primaries; central tail feathers light silvery grey with wide black terminal band, rest of tail black; iris red or reddish-brown; bill and legs blackish-grey. Sexes similar. Juvenile has buffy fringes of body feathers and tertials, and narrower central tail feathers; first-year aged by retained worn (brown) juvenile primaries and retained narrower tail feathers. Voice. Variety of vocalizations, many calls louder, harsher and more metallic than those of *D. vagabunda* and surprisingly similar to those given by Greater Racquet-tailed Drongo (*Dicrurus paradiseus*), with which it often loosely associates; this likely due to mimicry. Vocalizations include short, dry rattle terminating in frog-like croak, lower, coarser dry rattle ending in sharp note, "krrrrrrrrrrrrrr, quit", castanet-like rattling "kt-kt-kt-kt-kt", high-pitched clanging "quang, quang, quang" (3–5 notes), liquid "ko-koo" (in display), harsh "kraa" (perhaps an alarm call), throaty "chuff-chuff-chuff" (by two birds facing each other and jumping up and down), rapid "took- took-took", and remarkable series of 7 very deep "clunky" knocking notes. Significance of many of these uncertain.

Habitat. Humid evergreen hill forests, both primary and relict patches within secondary forests; especially sholas (small ravines) with cardamom plantations, overgrown abandoned rubber plantations, large roadside trees and so on. Avoids human habitation and human contact in general. Foothills to mountain forest-line, from 60 m to 1500 m. Overlaps in range with *D. vagabunda*, but prefers lusher evergreen forest, whereas latter species found in dry deciduous woodland.

Food and Feeding. Omnivorous, primarily carnivorous. Prey items include variety of invertebrates and their larvae, also small vertebrates such as small lizards and rodents, and eggs and nestlings of small birds. Fond of flower nectar and a variety of fruits and seeds, particularly ripe seeds of *Sterculia villosa*, which it devours by stripping the orange pods. Typically in pairs or family parties. Often with mixed foraging parties of other forest birds, particularly Greater Racquet-tailed Drongos; when associating with these mixed flocks, it readily comes down to bushy undergrowth, and more rarely descends to ground.

Breeding. Eggs recorded in Feb–Apr, chiefly Mar and Apr. Solitary breeder. Nest a rather deep construction of prickly twigs, cup lined with smaller twigs, rootlets and other soft plant material, well hidden inside canopy of large forest tree or tall shrub, generally well away from human habitation. Clutch 3 or 4 eggs. No other information.

Movements. Sedentary, as far as is known. Some old reports from SE Gujurat, Goa, Bangalore and particularly S Andhra Pradesh (E to Palmaner).

Status and Conservation. Not globally threatened. Restricted-range species: present in Western Ghats EBA. Locally quite common in lush tropical evergreen forests. Present in a number of pro-

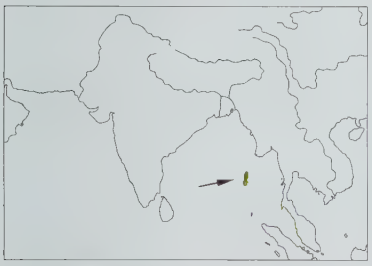
tected areas, including Periyar and Silent Valley National Parks, Thattakad (Salim Ali) Bird Sanctuary, and Topslip. Most remarkable is an old specimen purportedly from Gawilgarh Hills, in C India, which is not only well outside this species' known range but also the wrong habitat (dry scrub-forest); report probably erroneous, but, if genuine, would suggest either propensity to extensive wandering or a subsequent massive range contraction.
Bibliography. Ali & Ripley (1972, 1987b), Dickinson *et al.* (2004), Goodwin (1986), Grimmett *et al.* (1998), Madge & Burn (1994), Rasmussen & Anderton (2005a, 2005b), Stuart Baker (1928), Vaurie (1958a).

60. **Andaman Treepie**

Dendrocitta bayleii

French: Témia des Andaman **German**: Andamanenbaumelster **Spanish**: Urraca de Andamán

Taxonomy. *Dendrocitta bazlei* [sic] Tytler, 1863, Andaman Islands.
Original description first used name "*bazlei*" but publisher's corrigendum explicitly corrected this to "*bayleii*"; as all falls within same volume of same journal, the emendation stands. Species name sometimes erroneously given as *bazlei*, *bayleyi* or *baileyi*. Monotypic.
Distribution. Andaman Is.



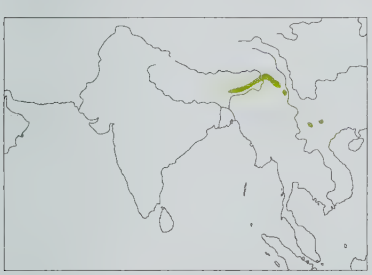
Descriptive notes. 32 cm; 92–113 g. Unmistakable small treepie, the smallest of genus, with large white wing patch and pale eyes; long, strongly graduated tail, central pair of feathers little longer than the next, rather short bill less stout than others of genus and with more gently curved culmen. Head and neck are dark bluish-grey, shading into blackish on face and forecrown; upperparts dark tawny-brown, brighter rufous on rump, becoming grey on uppertail-coverts; upperwing black, white patch at bases of primaries and inner secondaries; tail blackish, shading to dark grey over basal half of central feathers; underparts bright rufous, shading into greyish on upper breast and chestnut on undertail-coverts; iris yellow; bill blackish; legs blackish-grey. Sexes similar. Juvenile has sooty reddish-brown hood, darker and redder upperparts (reddish feather margins), greyish-brown fringes of wing-coverts, rather shorter and greyer tail, and olive iris; iris becomes brighter green before turning into yellow of adult. Voice. Poorly documented. Said to have repeated harsh alarm note, and metallic sound likened to "a coarse file being drawn across the teeth of a saw"; also a fluty whistle "kiu-duu" like that of an Old World oriole (*Oriolus*), and harsh, rasped "kyow". Some calls similar to those of Andaman Drongo (*Dicrurus andamanensis*), with which it often associates.
Habitat. Dense, humid evergreen forests, where it favours the largest trees.
Food and Feeding. No information on diet; presumably omnivorous. Typically encountered in small parties, with as many as 12–20 in loose company following mixed-species bird waves. Usually works its way through mid-canopy level, especially in company of Andaman Drongos. General behaviour assumed to be much as that of congeners.
Breeding. Eggs recorded Mar–May. Solitary breeder. Nest a rather flimsy structure of fine twigs and grasses, smaller and neater, more compact, than that of *D. formosae*, lined with fern rootlets and other soft plant material, well hidden c. 5 m above ground inside dense foliage of small forest tree. Clutch 3 eggs. No further information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Andaman Islands EBA. Not uncommon in suitable forest habitat. Transect surveys undertaken in 1993 and 1994 located 36 individuals on a total of nine islands, including main islands of Middle Andaman and South Andaman and smaller Baratang I. Forest destruction is widespread on the larger, most populated island of South Andaman. Several forest reserves and protected areas have been created on the islands. The future of this forest species depends on enforcement of logging restrictions.
Bibliography. Abdulali (1965), Ali & Ripley (1972, 1987b), Anon. (2008p), Butchart & Stattersfield (2004), David *et al.* (2009), Davidar *et al.* (1997), Dickinson *et al.* (2004), Goodwin (1986), Grimmett *et al.* (1998), Madge & Burn (1994), Rasmussen & Anderton (2005a, 2005b), Stattersfield & Capper (2000), Vaurie (1958a).

61. **Collared Treepie**

Dendrocitta frontalis

French: Témia masquée **German**: Maskenbaumelster **Spanish**: Urraca Acollarada
Other common names: Black-faced/Black-browed/White-naped Treepie

Taxonomy. *Dendrocitta frontalis* Horsfield, 1840, Assam, India.
Birds from N Vietnam (Tonkin) described as a race, *kurodae*, but differences from birds in rest of species' range appear minimal. Treated as monotypic.
Distribution. E Himalayas in Bhutan and NE India (Arunachal Pradesh and E Assam), N Myanmar, S China (extreme SE Xizang and W Yunnan), and apparently isolated population in N Vietnam (N Tonkin).



Descriptive notes. 38 cm; c. 100 g. Richly coloured little treepie with chestnut rear body and uniformly black long, strongly graduated tail, central pair of feathers considerably longer than the next, rather short and stout bill with strongly curved culmen and cutting edges. Has front half of head back to level of mid-crown, middle ear-coverts and upper breast black, separated by very narrow whitish-grey border from clean light grey nape, side of neck, hindneck and lower breast; upperparts are chestnut-brown, upperwing black, chestnut lesser coverts and grey median and greater coverts (forming band across closed wing), tail black; underparts below breast rich chestnut; iris red or reddish-brown; bill and legs blackish-grey. Sexes similar. Juvenile has buffy fringes of body feathers and tertials, and narrower central tail feathers; first-year aged by retained worn (brown) juvenile primaries and retained narrower tail feathers. Voice. Poorly documented. Said to have variety of typical treepie vocalizations, some quite musical, others harsh and grating.
Habitat. Humid evergreen foothill forests, preferably with extensive stands of bamboo. From foothills to 2100 m.
Food and Feeding. Omnivorous, primarily carnivorous. Prey items include variety of invertebrates and their larvae, also small vertebrates such as small lizards and rodents, and eggs and nestlings of small birds. Also variety of seeds and berries. Typically in pairs or family parties, with up to 20 individuals reported on occasions at rich food source, e.g. sudden emergence of winged termites (Isoptera); observed to make flycatching sallies from tops of tall bamboos in manner of drongos (Dicruridae) during such a termite swarm. General behaviour much for others of genus.
Breeding. Season Apr–Jul. Solitary breeder. Nest smaller and neater, more compact, than that of *D. formosae*, lined with fern rootlets and other soft plant material, well hidden inside bamboo thicket or in top of large prickly shrub at edge of forest. Clutch 3 or 4 eggs; no information on incubation and fledging periods.
Movements. Sedentary, as far as is known.
Status and Conservation. Not globally threatened. Not well known; rare to locally fairly common. Local in Bhutan; parties of up to 20 individuals located in Namning area of EC Bhutan in 1991. Apparently not uncommon in extreme NE India, but recent reports from Arunachal Pradesh and E Assam do not support this. Rare in China, and recorded only in extreme SE Xizang and on Yunnan–Myanmar border (in Gaoligong Mts). Isolated population in N Vietnam very little known. Old reports from Sikkim, but no recent records, and habitat in S Sikkim perhaps now too degraded to support a breeding population. No reliable evidence that it ever occurred in Nepal or Darjeeling. In view of the low level of sightings, it seems prudent to suggest that the conservation status of this species be reassessed.
Bibliography. Ali (1949, 1962), Ali & Ripley (1972, 1987b), Chen Fuguan *et al.* (1998), Dickinson *et al.* (2004), Goodwin (1986), Grimmett *et al.* (1998), Inskipp *et al.* (1999), Katti *et al.* (1992), King *et al.* (2001), MacKinnon & Phillipps (2000), Madge & Burn (1994), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Tymstra *et al.* (1997), Vaurie (1958a).

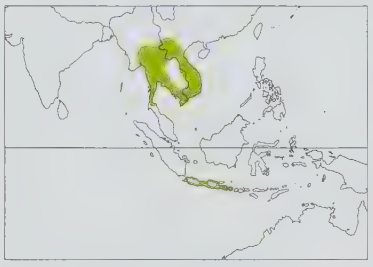
Genus *CRYPSIRINA* Vieillot, 1816

62. **Racquet-tailed Treepie**

Crypsirina temia

French: Témia bronzée **German**: Spatelbaumelster **Spanish**: Urraca Bronceada
Other common names: Black Racquet-tailed Treepie, Black/Bronzed Treepie

Taxonomy. *Corvus temia* Daudin, 1800, Africa; error = Java.
Monotypic.
Distribution. Lowlands of S & SE Myanmar, Thailand, extreme S China (S Yunnan), Laos, Vietnam and Cambodia; also Java and Bali.



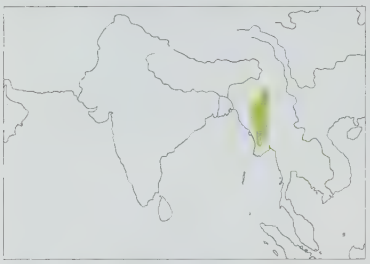
Descriptive notes. 31–33 cm; 114–145 g. Rather small, slender all-dark treepie with very long, graduated tail (of ten, not twelve, rectrices) which has spatulate expansion at tip, rather short but stout bill with curved culmen; feathers of forecrown and lores soft and velvet-like, forming cushion over nares. Entire plumage is blackish with bronze-green sheen (in good light, matt black of face and throat contrasts with shiny remainder of plumage); tail and flight-feathers blacker-looking, only slightly glossed; iris dull blue or pale blue; bill and legs black. Sexes similar. Juvenile has brown iris, is dull greyish-black overall, lacks contrasting velvety black appearance of forehead and lores, and tail lacks expansion at tip. Voice. Nasal mewing call. Also, often utters high-pitched but gruff "chu"; deep rasping "churg-churg", often rising to enquiring finish, "churrrk?", or given at higher pitch as "chrrrk-chrrrk" or "gasp-gasp".
Habitat. Lowland open forests to 1000 m in altitude, with clearings about villages and plantation edges, also mixed secondary growth, including fringes of mangroves.
Food and Feeding. Omnivorous. Surprisingly poorly known, with little precise information. Known to feed on variety of invertebrates, with fondness for large beetles (e.g. Scarabaeidae), and doubtless also fruits and berries. Forages almost entirely inside foliage of bushy growth and in lower to middle canopy of larger trees. Usually encountered singly, in pairs or in family parties, moving through cover. Hops and climbs up through hanging tangles with agility, using tails as a counterbalance; in this repect, reminiscent of malkohas (*Phaenicophaeus*). Rarely seen on the ground, except when bathing. Seldom flies far.
Breeding. Poorly studied. Eggs reported in Apr–Aug in Myanmar and Thailand and Apr in N Vietnam (Tonkin). Solitary breeder. Nest constructed from twigs, tendrils and creeper stems, cup lined with finer tendrils and rootlets, generally well hidden in dense cover 2–5 m above ground inside shrubby cover, preferably in isolated shrubby thicket or bamboo clump, hanging creepers, surrounded by open grassy area. Clutch 2–4 eggs. No other information.
Movements. Sedentary, as far as is known.
Status and Conservation. Not globally threatened. Not uncommon in most of range. Formerly occurred in extreme NW Peninsular Malaysia (Kedah), but apparently extirparted there; was quite frequent in 1930s and 1940s, but only one report since, in 2003; reasons for this local disappearance unclear. A 19th-century specimen said to have been taken at S tip of Sumatra and two from Borneo are regarded as erroneous; at least one of these considered to have originated from Java. Reliance on lowland forest makes this species vulnerable to habitat destruction and distributional fragmentation. Main factor in its favour for future survival is its tolerance of secondary forest, and the fact that it is often seen around forest clearings with human habitation.
Bibliography. Dickinson *et al.* (2004), Glenister (1951), Goodwin (1986), Lekagul & Round (1991), MacKinnon & Phillipps (1993), Madge & Burn (1994), Robson (2000), Thomas & Poole (2003), Vaurie (1958a), Wells (2007).

63. **Hooded Treepie**

Crypsirina cucullata

French: Témia à collier **German**: Kapuzenbaumelster **Spanish**: Urraca Encapuchada
Other common names: Hooded Racket-tailed Treepie

Taxonomy. *Crypsirina* (*Temia*) *cucullata* Jerdon, 1862, Thayetmyo, Myanmar.
Monotypic.
Distribution. Lowlands of C & S Myanmar.



Descriptive notes. 29–31 cm; c. 130–135 g. Small, slender light grey treepie with distinctive black hood and wings and very long black tail (of ten, not twelve, rectrices) which has almost spoon-shaped expansion at tip, rather short but stout bill with curved culmen; feathers of forecrown and lores soft and velvet-like, forming cushion over nares. Hood from upper nape down to throat black with oily green sheen, narrow whitish-grey border surrounding hood, being most noticeable on nape; body plumage almost uniformly light grey, washed bluish-grey above and mauve-fawn below; upperwing-coverts and tertials fawn-grey, greater coverts fringed whitish, tertials tipped whitish, primaries and primary coverts black, outer secondaries blackish with whitish outer webs (forming narrow white panel on folded wing); central tail feathers black, remainder pale fawn-grey (these normally concealed when tail closed; iris dark blue, orbital ring blackish; bill and legs black. Sexes similar. Juvenile is duller and browner grey than adult, with dark brown hood, tail tip narrow (not spoon-shaped), bill blackish, with extensive orange inside mandibles and at base of lower mandible, iris probably dark brown, narrow light blue orbital ring; after first moult, differs from adult in being darker grey above, lacking narrow pale border to hood, retains narrow-tipped tail feathers, gape patch smaller and yellower than juvenile; some yellow may be visible on gape into second year. Voice. Poorly documented. Contact call a quiet purring "drrrriiii'k"; said also to give several harsh, discordant calls.
Habitat. Lowland open dry forests to 950 m, in plains of R Irrawaddy and R Sittang; little of this forest remains, but it seems to survive in remaining patches of deciduous woodland. Also about stands of bamboo and in thorn-scrub jungle, with clearings surrounding villages, and mixed secondary growth.
Food and Feeding. Little precise information. Reported prey items included grasshoppers and locusts (Orthoptera), mantids (Mantidae) and winged termites (Isoptera). Feeds almost entirely inside foliage of bushy growth and in lower to middle canopy of larger trees. Usually encountered singly, in pairs or in family parties, moving through cover; flocks of up to 30 recorded on occasion.
Breeding. Poorly studied. Eggs reported May and Jul. Solitary breeder. Nest described as resembling small, neat version of that of *Pica pica*, based on protective exterior of thorny twigs, which are continued over nest as partial dome; well hidden inside dense thicket or small tree. Clutch (three known) 2–4 eggs. No other information.
Movements. Sedentary, as far as is known.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Irrawaddy Plains EBA. Recently found to be not uncommon in suitable habitats. Partial reliance on lowland dry forest could render it vulnerable to habitat destruction. Main factor in its favour for its future survival is its tolerance of secondary forest and even scrub-jungle, and the fact that it is often seen around clearings with human habitations.
Bibliography. Anon. (2008p), Butchart & Stattersfield (2004), Goodwin (1986), Madge & Burn (1994), Robson (2000), Robson *et al.* (1998), Smythies (1953), Stattersfield & Capper (2000).

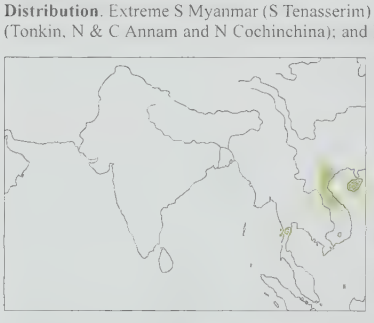
Genus *TEMNURUS* Lesson, 1831

64. Ratchet-tailed Treepie

Temnurus temnurus

French: Témia temnure **German**: Leiterschwanzelster **Spanish**: Urraca de Raquetas
Other common names: Notch-tailed Treepie

Taxonomy. *Glaucopis temnura* Temminck, 1825, Cochinchina, Vietnam.
Monotypic.
Distribution. Extreme S Myanmar (S Tenasserim) and adjacent SW Thailand; C Laos and Vietnam (Tonkin, N & C Annam and N Cochinchina); and Hainan I (S China).



Descriptive notes. 32–35 cm; c. 138 g. Rather small, dark treepie with fairly long, graduated tail (of ten, not twelve, rectrices), rather stout bill with curved culmen; feathers of forecrown and lores soft and velvet-like, forming cushion over nares. Entire plumage is blackish, with weak sheen on head, wing and tail; tip of each rectrix notched into a pair of pointed extensions, which project sideways down each side of tail (points not always obvious); iris dark brown or red; bill and legs black. Sexes similar. Juvenile undescribed; first-year has retained juvenile tail feathers, which narrower than those of adults and with terminal points shorter or perhaps lacking. Voice. Quite varied vocabulary. Pair-members often call in duet, one giving incisive start followed by a ringing terminal note, "clipeeee", mate coming in with rapid double hollow "pupu" at start, "pupueeee". Variations on a similar theme are a ringing double "clee-clee" and a constantly repeated squeaky two-syllable call, ringing and with rising inflection, "eeup, eeup, eeup…". Also gives short, high-pitched rasping "rrrrrrrrr" and harsh grating, but very slow chatter, "graak graak graak".
Habitat. Lowland and hill forests, chiefly dry broadleaf evergreen forests to at least 1200 m; also mixed secondary growth with stands of bamboo, forest edges and scrubby, grassy clearings, even around villages.
Food and Feeding. Surprisingly poorly known, with little precise information. Known to feed on variety of insects and other invertebrates. Observed singly, in pairs and in family groups, often with mixed foraging parties of other birds, especially Greater Racquet-tailed Drongos (*Dicrurus paradiseus*). Often sits rather upright at mid-canopy level.
Breeding. Little known. Eggs reported Apr–Jun. Solitary breeder. Nest built from twigs, with shallow cup; few nests found have been inside bamboo thickets. Clutch 2 eggs. No other information.
Movements. Sedentary, as far as is known.
Status and Conservation. Not globally threatened. Widespread and not uncommon in Laos and Vietnam; little known in rest of range. Easily overlooked, being quite sluggish and rather unobtrusive in habits, but draws attention to itself by persistent calling. In 1991, population discovered unexpectedly in Kaeng Krachan National Park, in SW Thailand; habitat there is continuous with forest in Myanmar, and part of one of largest remaining stretches of forest in SE Asia. Reliance on lowland forest makes it vulnerable to habitat destruction. Loss of forest on Hainan does not bode well for its future there.
Bibliography. Chen Fuguan *et al.* (1998), Dickinson *et al.* (2004), Duckworth *et al.* (2002), Ericson *et al.* (2005), Goodwin (1986), Hartlaub (1899), Kalyakin (1996), MacKinnon & Phillipps (1993), Madge & Burn (1994), Robson (2000), Robson *et al.* (1993).

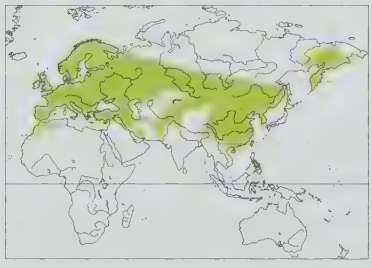
Genus *PICA* Brisson, 1760

65. Common Magpie

Pica pica

French: Pie bavarde **German**: Elster **Spanish**: Urraca Común
Other common names: Eurasian/Pied Magpie; Black-billed Magpie (when treated as conspecific with *P. hudsonia*); Maghreb Magpie (*mauritanica*); Kamchatka Magpie (*camtschatica*); Tibetan/Black-rumped Magpie (*bottanensis*); Oriental Magpie (*serica*)

Taxonomy. *Corvus pica* Linnaeus, 1758, Uppsala, Sweden.
Forms a superspecies with *P. asirensis*, *P. nuttalli* and *P. hudsonia*, and often treated as conspecific with first and/or last of those. Several races possibly warrant elevation to species rank, pending further research into comparative vocalizations and social behaviour as well as DNA molecular studies: N African *mauritanica* may have reached species level, but Spanish *melanotos* approaches it in several respects and may be more closely allied to it than to nominate race; distinctive *camtschatica* of NE Siberia is also isolated, while *bottanensis* of Tibetan region differs strongly from neighbouring forms, but is said to intergrade with *anderssoni* in N of its range; SE Asian *serica* exhibits interesting similarity to European races, although it seems that such superficial similarity may not be supported by findings of DNA studies. Many intergrading populations exist. A number of other races have been described, but situation complicated by intermediates (e.g. *anderssoni* is possibly an intermediate series of populations): *galliae* (from France) and *germanica* (Germany) are included in nominate race; *kot* (E Ukraine), *laubmanni* (Kelat, in Pakistan) and *hemileucoptera* (C Siberia) in *bactriana*; *japonica* (Japan), *amurensis* (near Khabarovsk, in Ussuriland) and *jankowskii* (near Vladivostok) in *anderssoni*; and *hainana* (Hainan I) and *alashanica* (Ala Shan, in C China) in *serica*. Race *serica* often misspelt "*sericea*". Ten subspecies currently recognized.
Subspecies and Distribution.
P. p. fennorum Lönnberg, 1927 – N Scandinavia, Finland and NE Baltic region E to W Siberia.
P. p. pica (Linnaeus, 1758) – from British Is and S Scandinavia E to E Europe, S to Mediterranean, including most islands.
P. p. melanotos A. E. Brehm, 1857 – Iberian Peninsula.
P. p. mauritanica Malherbe, 1845 – N Africa (Morocco, N Algeria and Tunisia).
P. p. bactriana Bonaparte, 1850 – Siberia E to L Baikal, S to Caucasus, Iraq, Iran, C Asia and Pakistan.
P. p. leucoptera Gould, 1862 – S Transbaikalia (Russia), Mongolia and NE China (Inner Mongolia and NW Heilongjiang.
P. p. camtschatica Stejneger, 1884 – N Sea of Okhotsk, Kamchatka and Anadyrland (in Russian Far East).
P. p. anderssoni Lönnberg, 1923 – SE Russia (Ussuriland), extreme NE China and Korea.
P. p. bottanensis Delessert, 1840 – WC China (Qinghai and W Sichuan S to S & E Xizang) and C Bhutan.
P. p. serica Gould, 1845 – E & S China, Taiwan, N Myanmar, N Laos and N Vietnam.
Introduced (race *serica*) on Kyushu (Japan).



Descriptive notes. 46–50 cm; 200–270 g (various races), male 185–247 g and female 161–240 g (nominate), male 214–268 g and female 208–232 g (*leucoptera*). Very distinctive magpie, mainly black and white, with long, graduated tail, medium-sized bill relatively wide at base, culmen downcurved distally. Nominate race has head down to breast and most of upperparts black with inconspicuous purple and green sheen; scapulars white, narrow greyish band across rump; upperwing black, highly glossed green or greenish-blue on secondaries and tertials, inner webs of primaries white with black tips and bases, white usually concealed when bird at rest (but forming huge band on opened wing); tail black, highly glossed with green and reddish-purple, becoming almost matt black at very tip; flanks and central underparts white, lower belly, tibia feathering and undertail-coverts black; iris dark brown; bill and legs black. Sexes similar. Juvenile is similar to adult but duller, with black areas of plumage unglossed and sooty black, white areas tinged buffy, when recently fledged has patches of bare grey or grey-blue skin around eye and on malar, becoming much as adult by late summer. Races differ mainly in intensity of gloss in black areas of plumage, extent of white in wing, prominence or absence of white in rump, comparative tail length and size: *fennorum* is larger and has more extensive white on rump than nominate; *bactriana* has prominent white rump, more extensive white in primaries (showing as white tips on closed wing); *serica* is small and dark, remarkably similar to nominate but with relatively shorter tail and greener gloss on secondaries; *anderssoni* resembles previous, but is somewhat larger and paler; *bottanensis* is very distinctive, having black rump, relatively short tail, stout bill, and very little gloss in plumage; *leucoptera* has very extensive white in primaries, and tail gloss is yellowish brass-green; *camtschatica* has most extensive white in primaries, showing as white tips down folded wing, also has brightest and most extensive green gloss of all races; *melanotos* has black rump, extent of white in primaries much as nominate, in S of range sometimes a blue spot of bare skin behind eye; *mauritanica* has black rump, bronze gloss on wings and tail, is relatively longer-tailed than others, and has relatively large blue patch of bare skin behind eye. Voice. Typical call a raucous, explosive rapid chatter, "chak-chak-chak-chak-

chak-chak-chak"; also a single, more relaxed, almost enquiring "ch-tak?" and high-pitched, squealed "keee-uk". Some geographical variation in pitch and speed of delivery of the chattering call, e.g. SE Asian *serica* has a somewhat softer chatter than that of European birds. N African *mauritanica* has higher-pitched chatter, uttered with more undulating rhythm compared with nominate; said also to have a more varied vocabulary than nominate, but seemingly these remarks apply to S Moroccan birds (those in N Morocco seem to be vocally closer to nominate). Like many other corvids, utters a subdued warbling song, interspersed with high-pitched notes and even some mimicry; such songs uttered mainly by unpaired individuals and audible only at close range.
Habitat. Inhabits a tremendous variety of open country, preferably with at least scattered trees. Avoids both tracts of treeless country and extensive woodland or forests. In man-modified landscapes, favours mixed farmland, parks and gardens, with overgrown hedges and small stands of trees. In recent decades increasingly common in urban areas, especially in places with avenues of trees; can reach very high densities in parts of urbanized Europe.
Food and Feeding. Omnivorous, but chiefly a carnivorous scavenger. Diet varies according to local habitats, basically of invertebrates, especially beetles (Coleoptera), and small mammals and lizards, frogs, bird eggs and nestlings, as well as carrion. Pairs patrol roadsides in the early mornings, exploiting overnight roadkills. In addition, various seeds, berries and fruits are taken seasonally. Takes a variety of food scraps, and where unmolested can become cautiously confiding around picnic sites and in city parks, regularly visiting refuse bins. Feeds almost entirely on ground, walking with bold, strutting gait, carrying tail upwards as it searches for insects; side-hops to catch prey. Perches on cattle and sheep to feed on ectoparasites, such actions sometimes resulting in aggravated sores for the host animal. Freely stores food, but usually retrieves items within a few days. Although not known for its agility in the air, will pursue other birds to force them to drop or regurgitate food items; exceptionally, recorded as capturing small birds in flight, including a House Sparrow (*Passer domesticus*). Normally utilizes lowest air-space, flying between trees with undulating flight action, sweeping up to perch just inside canopy. Although often encountered in pairs or family parties, larger groups are not uncommon, and assemblages of 20 or more gather for communal roosts. In Turkmenistan as many as 2000 have been estimated at one winter gathering, and in the Tibetan region of Asia ten magpies were counted as they left a single roosting nest; it seems that Tibetan individuals build several roosting nests, very close to or contiguous with one another, for added warmth. Biggest known urban roost is in L'viv (Lwow), in W Ukraine, where 1700 individuals recorded. Roosts in towns tend to be larger than those in farmland.
Breeding. Season commences with nest-building as early as Dec in Britain, mid-Apr being peak time for first egg-laying; dates similar elsewhere in Europe and, surprisingly, in Turkmenistan, but later, with laying chiefly last week Apr, in C Siberia; single-brooded. Monogamous long-term pair-bond, partners keeping together throughout year, even when flocking. Solitary nester. Nest construction undertaken by both sexes, female doing bulk of building, male supplying most of materials, work takes 1–8 weeks (depending on experience of builders and availability of materials); nest a rather large, distinctively domed structure (occasionally undomed, especially in urban areas, where up to 32% of nests may be open), made from sticks and twigs, with side entrance protected by thorny twigs (in areas where twigs hard to come by, nest occasionally made entirely from wire), deep cup thickly lined with soft materials such as wool, animal fur, soft grasses and feathers, usually placed at variable height in crown of tall tree; normally a fresh nest built each year, although in some cases (e.g. where availability of nest-sites limited) an old nest may be repaired; in more open habitats electricity pylons also used as nest-site (nests on pylons in Khabarovsk region of Amurland/Ussuriland reach massive proportions, as fresh nest built each year on top of previous), and in habitats with few trees a stunted shrub may be used, or nest built on antenna mast or old building or even on ground, sheltered by heather (Ericaceae), stone wall or rocks. Clutch 2–8 eggs, chiefly 5–7; incubation entirely by female, fed at nest by male, period 21–22 days; chicks fed by both sexes, mainly by male, leave nest after 24–30 days, dependent on adults for several weeks further; in autumn, young join up with flocks of non-breeders. Nests parasitized by Great Spotted Cuckoo (*Clamator glandarius*). Able to breed for first time when 15–17 months old.
Movements. Essentially resident; few ringing recoveries of more than 30 km. Those in N Scandinavia move S following adverse weather conditions, in some years flocks gathering in S Sweden and attempting sea crossing to Denmark (apparently relatively few succeed, the majority turning back). Finnish birds, presumably from far N, may move farther than assumed, as indicated by several ringing recoveries of more than 100 km, including one of 450 km. In Siberia, populations in extreme N of range shift S during severe weather, joining gatherings of magpies which are attracted towards towns and settlements from the open countryside. Being in general remarkably sedentary, the species is not prone to vagrancy, but vagrants reported from Singapore, Israel, Lebanon, and Isles of Scilly (off extreme SW England).
Status and Conservation. Not globally threatened. Widespread and common in much of range; locally abundant. In most European countries has apparently increased over recent decades, most notable being its spread into cities from the countryside. Following estimates (territories/pairs) made for countries within W Palearctic: Britain 590,000, Ireland 320,000, France 200,000–700,000, Belgium 19,000, Luxembourg 8000–10,000, Netherlands 60,000–120,000, Germany 280,000–360,000, Denmark 31,000–320,000, Norway 200,000–500,000, Sweden 300,000–600,000, Finland 150,000–200,000, Estonia 50,000–100,000, Latvia 10,000–20,000, Lithuania 70,000+, Poland 400,000–800,000, Czech Republic 40,000–80,000, Slovakia 30,000–60,000, Hungary 100,000–140,000, Austria 4000–5000, Switzerland 20,000–40,000, Italy 100,000–500,000, Spain 220,000–1,200,000, Portugal 10,000–100,000, Greece 30,000–80,000, Albania 10,000–30,000, Croatia 60,000–80,000, Slovenia 8000–12,000, Bulgaria 1,000,000–5,000,000, Romania 100,000–200,000, Russia 1,000,000–10,000,000, Belarus 480,000–500,000, Ukraine 1,300,000–1,500,000, Moldova 60,000–70,000, Azerbaijan 2000+, Turkey 1,000,000–10,000,000; in N Africa, widespread but localized in Morocco and Algeria and few in Tunisia. Densities often high, the highest being 32 pairs/km²; in prime habitat in N England 4–16 pairs/km². In N Africa patchily distributed, nests on average 264 m apart within "patches". Has for long been persecuted as "vermin" by gamekeepers and farmers owing to its egg-stealing and nest-robbing habits; also, its habit of feeding on ectoparasites on livestock sometimes results in aggravated sores for the host animal. A reduction in keepering intensity, especially in W of range, since 1920s, however, has allowed a steady increase, which accelerated in 1950s as the creation of larger suburban gardens and city and town parks provided safer habitats from human persecution; over much of its European range it is still increasing, as urban and suburban areas also provide easy scavenging. Rapid increase noted in 1970s and 1980s in European urban areas, and later in Asian parts of former USSR; colonization of new areas in S (deserts) and N (within Arctic Circle) closely associated with human economic activity in these otherwise inhospitable landscapes. Members of the general public now witness its nest-raiding habits in their own gardens, although extent of damage done by this species to garden bird populations is minimal compared with that inflicted by domestic cats. In SE of its global range, there have been no recent records from Laos and it could well be extinct there; has also become very rare in adjacent Vietnam. As with other corvids, old nests of this species are used by a number of other birds, including Long-eared Owls (*Asio otus*), sparrowhawks (*Accipiter*) and various falcons (*Falco*).
Bibliography. Ali & Ripley (1972, 1987b), Bährmann (2002), Bannerman (1954), Birkhead (1991), Brazil (1991), Chen Fuguan *et al.* (1998), Coombs (1978), Cramp & Perrins (1994), Czechowski *et al.* (2005), Dementiev *et al.* (1954, 1970), Ebels (2003), Fuchs *et al.* (2007), Goodwin (1986), Grimmett *et al.* (1998), Haffer (1993b), Hagemeijer & Blair (1997), Inskipp *et al.* (1999), Jerzak (2001), Madge & Burn (1994), McCarthy (2006), Rasmussen & Anderton (2005b), Roberts (1992), Roselaar (1995), Sangster *et al.* (1997), Snow & Perrins (1998), Stepanyan (1990, 2003), Tomek (2002), Vaurie (1954, 1959).

66. Arabian Magpie

Pica asirensis

French: Pie d'Arabie **German**: Asirelster **Spanish**: Urraca Árabe
Other common names: Asir/Asian Magpie

Taxonomy. *Pica pica asirensis* Bates, 1936, Asir Mountains, south-western Arabia.
Forms a superspecies with *P. pica*, *P. nuttalli* and *P. hudsonia*; often treated as conspecific with first of those, but isolation within very restricted range and differences in vocalizations and structural features suggest that treatment as a separate species warranted. Monotypic.
Distribution. Asir massif, in SW Saudi Arabia.



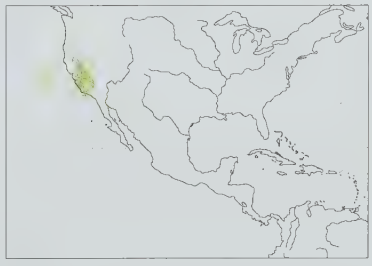
Descriptive notes. 46 cm; 200 g. Unmistakable within its range; distinctive black-and-white corvid with long, graduated tail. Head to breast and upperparts are black with, at most, slight sheen (not obvious), only a little white on outer scapulars, upperwing black, glossed dark purplish-blue on coverts and tertials, inner webs of primaries with white centrally, tail black with dark greenish-purple or bronze-purple gloss; flanks and central underparts white, undertail-coverts, lower belly and tibia feathering black; plumage prone to bleaching when worn (exposed glossy parts of wings and tail become dull bronze-brown); iris dark brown; bill and legs black. Differs from *P. pica* mainly in having more extensive black in plumage, wholly black rump, narrower white scapular patch, less extensive white in primaries, also tail relatively shorter, bill relatively larger, foot stronger. Sexes similar. Juvenile is similar to adult but duller, with black areas of plumage unglossed, and white areas washed with brown. Voice. Calls very different from those of *P. pica*. Three types of call described: a full, loud "quaynk-quaynk" given from top of bush or when a party is on the move; weaker "quenk, quenk" when bird alarmed or stressed during foraging; and soft "qua, qua" by food-begging young. Seems to be very vocal, group-members keeping in contact as they forage.
Habitat. Restricted to juniper (*Juniperus*) forest and well-vegetated wadis, at 2400–3000 m.
Food and Feeding. Omnivorous, but few details. Recorded food items "insects", caterpillars, juniper berries, also food scraps from picnic sites, including boiled rice, also fallen grain and fruiting figs (*Ficus*). Forages in small groups of up to seven individuals, presumably family parties; rarely seen alone. Roosts in trees in well-vegetated wadis, foraging ceaselessly from dawn to dusk (can be from 05:20 to 19:20 hours) over area 2–3 km from roost-site. At first light group leaves roost and scatters into nearby trees, moving on after a few minutes.
Breeding. Egg-laying in early Feb. Nest typical of genus, a somewhat oval mass of twigs with side entrance, interior cup lined with soft plant materials (chiefly rootlets) and feathers, placed c. 5–6 m above ground at base of fork in juniper tree, rarely in acacia (*Acacia*); seems to build fresh nest each year. Both sexes feed the young. No other information.
Movements. Sedentary.
Status and Conservation. Not assessed. Hitherto treated as a race of *P. pica*. Possibly globally Near-threatened or threatened. Research indicates that perhaps fewer than 500 individuals survive; these now restricted to Abha and 120 km to N, and at Jibal al Qahr. Older reports indicate that range once extended throughout the Asir, even as far N as Taif. The lush vegetation in this part of Arabia is under threat from development for tourism, and climatic change is producing hotter and drier weather, forcing this species into pockets of remaining suitable habitat.
Bibliography. Bates (1936), Birkhead (1991), Cramp & Perrins (1994), Ebels (2003), Goodwin (1986), Madge & Burn (1994), Yahya (1998), Yahya & Salamah (1996).

67. Yellow-billed Magpie

Pica nuttalli

French: Pie à bec jaune **German**: Gelbschnabelelster **Spanish**: Urraca de Nuttall

Taxonomy. *Corvus nutalli* [sic] Audubon, 1837, Santa Barbara, California, USA.
Forms a superspecies with *P. pica*, *P. asirensis* and *P. hudsonia*. Sometimes treated as conspecific with first and/or last of those; recent analysis of mitochondrial genome suggests that *P. hudsonia* and present species are sister-taxa, closely related to *P. pica*, the three exhibiting low average divergence (only 2·35%), suggesting that they may be better considered conspecific. Emended spelling of species name has prevailing usage. Monotypic.
Distribution. California W of Sierra Nevada Mts (Sacramento Valley, San Joaquin Valley, and valleys of S Coast Ranges), in SW USA.



Descriptive notes. 43–54 cm; male 151–189 g, female 126–158 g. A medium-sized black-and-white corvid with long, graduated tail and yellow bill; most black areas strongly glossed blue. Head to upper breast and upperparts are black, head with slight green gloss, scapulars white, upperwing and tail black with conspicuous blue-green iridescence, inner webs of primaries white with black tip; lower breast to upper belly and flanks white, lower belly and undertail-coverts black; iris dark brown, variable patch of yellow skin above and below eye (sometimes fully around eye); bill yellow; legs black. Differs from *P. hudsonia* mainly in noticeably smaller size, proportionately longer wing, yellow bill. Sexes alike in plumage, male 10–17% larger than female. Juvenile is duller than adult, dark areas of plumage browner, looser in texture, and with less iridescence than adult; mouth lining fully black by second year. Voice. Not well studied. Stacatto, harsh "chatter" alarm call similar to that of *P. hudsonia*, but slower and higher-pitched (208 KHz) than chatter of *P. pica*. Soft, babbling song by male (may help to bring

female into breeding condition). Fertile female gives "clear" call, which is a begging call with rising inflection directed at mate with accompanying wing-flapping from two days prior to egg-laying. Accomplished mimic.

Habitat. Oak (*Quercus*) savanna where large trees are scattered among broad expanses of open grassland and pasture; forages also in cultivated fields and orchards. Water and large insects must be present throughout year. Increasing in abundance in some suburban settings, notably those in Sacramento Valley. Tolerates temperatures considerably warmer than those within range of *P. hudsonia*.

Food and Feeding. Omnivorous. Eats grasshoppers (Orthoptera), Lepidoptera, bees, ants and wasps (Hymenoptera), beetles (Coleoptera), true bugs (Hemiptera), and flies (Diptera), also (and observed to drown) mice (Muridae) and voles (Cricetidae); preys on bird eggs and nestlings, likely also small reptiles; readily consumes carrion (especially roadkills), and human handouts and offal. Variety of cultivated grains, fruits, and nuts also taken. Caches acorns (in trees and ground) in autumn, and supplements diet with large variety of other native fruits and seeds. More insectivorous and less of a predator and scavenger than *P. hudsonia*. Forages in flocks (often with other species), mainly on ground, for invertebrates (especially large Orthoptera and Lepidoptera). Forages with cattle, perhaps taking insects flushed by grazing herd; gleans insects from backs of ungulates and horses. Picks food from ground, or digs into soil and litter; flips over cow dung, makes flycatching sorties, and hunts from perches.

Breeding. Nest-building from late Dec to Mar, egg-laying mid-Mar to early May. Monogamous, apparently lifelong pair-bond. Male and some females pursue extra-pair copulations, male guards mate during fertile period, but female alone in nest or nest tree during egg-laying period. Loosely colonial, in groups of 3–30 pairs with average inter-nest distance 38 m (coloniality may account for nore frequent extra-pair copulations compared with *P. pica*), defends small core area (0·6–1·9 ha) around nest. Nest built by both sexes, female doing most of shaping of bowl and lining, construction work taking up to two months, a large, globe-shaped dome (up to 0·9 m in diameter), including a platform and domed roof of coarse twigs (less than 30 cm long), and a mud bowl lined with animal hair, grass, shredded bark or rootlets, placed high up (average 14·2 m) in large tree, typically oak, generally in mistletoe (Loranthaceae) clump and at end of long branch (to thwart predators); sometimes a refurbished old nest reused; Bullock's Oriole (*Icterus bullockii*) appears to nest preferentially within colonies of present species (benefiting from latter's effective anti-predator defence, thus achieving lower nest-predation rates). Clutch 4–9 eggs, usually 6–7; incubation by female alone, starting before clutch complete, period 16–18 days; hatching often asynchronous, chicks brooded by female, fed by both sexes, nestling period 30 days; young fed by both parents for up to 16 days after fledging; young from nests within colony may gather in crèche, but quickly form larger flocks containing young from several colonies. Majority of successful nests fledge only two or three young; starvation is major source of chick death (asynchronous hatching facilitates brood reduction).

Movements. Resident. Most juveniles not seen after they disperse, but a few males known to have obtained breeding territory within natal colony or in nearby colony (average 1260 m from natal territory); young females apparently disperse more widely. Occasional casual wandering, straying N almost as far as Oregon.

Status and Conservation. Not globally threatened. Restricted-range species: present in California EBA. Inhabits area of c. 240 × 800 km of bottomland and adjacent low foothills of Sacramento Valley (S from Redding) and San Joaquin Valley (S to base of Breckenridge Mt), and valleys of Coast Ranges from San Francisco Bay S to Goleta, Santa Barbara County. Home range during breeding averages 22·8 ha, expanded slightly to average 33·1 ha during non-breeding season. Small historical range, in which formerly common. Overall population drastically reduced since introduction of West Nile Virus to range in 2004: population of 180,000 birds in 2003 thought to have been reduced by 49% by 2006; presence in urban roosts greatly declined due to extreme mortality from the virus. Prior to 2004, locally abundant in some areas, e.g. Sacramento, although already declining in other areas as oak savanna was exploited for development, e.g. Salinas Valley and sprawling areas S of San Francisco. Vulnerable to poisons used for killing ground squirrels (Sciuridae), but able to learn by observation to avoid tainted baits and dangerous situations. Current threats, in addition to West Nile Virus and habitat loss to development and agriculture, include summer droughts, which reduce abundance of large insects, and Sudden Oak Death, which can reduce oak trees characterizing preferred habitat. Colony resilience dependent on low adult mortality (70% annual survival normal) and dispersal from other colonies to fill breeding vacancies.

Bibliography. Anon. (2000a), Birkhead (1991), Birkhead *et al.* (1992), Blackburn (1968), Bolen (1999), Bolen *et al.* (2000), Crosbie (2004), Crosbie *et al.* (2008), Enggist-Dublin & Birkhead (1992), Hayworth & Weathers (1984), Hope (1989), Kalmbach (1927), Klicka & Zink (1997), Koenig & Reynolds (1987), Lee Sang-Im *et al.* (2003), Linsdale (1937), Reynolds (1990, 1995), Richardson & Bolen (1999), Saunders & Edwards (2000), Verbeek (1972a, 1972b, 1973), Wiggins (1947), Zink *et al.* (1995).

68. Black-billed Magpie

Pica hudsonia

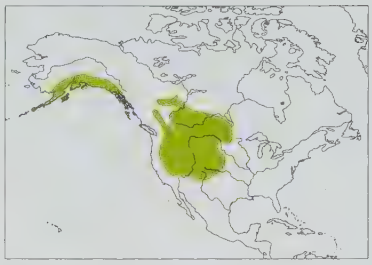
French: Pie d'Amérique **German**: Hudsonelster **Spanish**: Urraca de Hudson
Other common names: American Black-billed Magpie

Taxonomy. *Corvus hudsonia* Sabine, 1823, Cumberland House, Saskatchewan, Canada.

Forms a superspecies with *P. pica*, *P. asirensis* and *P. nuttalli*, and often treated as conspecific with first or all of those; recent analysis of mitochondrial genome suggests that *P. nuttalli* and present species are sister-taxa, closely related to *P. pica*, the three exhibiting low average divergence (only 2·35%), suggesting that they may be better considered conspecific. Monotypic.

Distribution. Coastal S Alaska (E from Alaska Peninsula and Shumagin Is) and SW Canada (SW Yukon, extreme NW & E British Columbia, N Alberta, C Saskatchewan, C Manitoba, extreme SW Ontario) S in W USA to NE & EC California (to Inyo County), SC Nevada, Utah, extreme NE Arizona (Apache County), N New Mexico, W (casually also NE) Oklahoma, C Kansas, and Nebraska (except SE).

Descriptive notes. 45–60 cm; 135–210 g, male 176–216 g and female 141–173 g (Idaho). A medium-sized, black-and-white corvid with long iriscent tail and a black bill. Has head to upper breast and upperparts black, scapulars white, upperwing and tail with metallic blue-green iridescence, primaries with black outer web, white inner web and black tip (large white wing patch in flight); lower breast to upper belly and flanks white, lower belly and undertail-coverts black; iris dark brown; bill and legs black. Differs from *P. nuttalli* mainly in noticeably larger size, longer tail, proportionately shorter wing, black bill. Sexes alike in plumage, male 6–9% larger and 16–20% heavier than female. Juvenile is duller and buffier than adult, plumage looser in texture, with less iridescence, tail feathers more rounded at tips; after first moult (Jul–Oct), immature similar to adult but with smaller white wing patches, mouth lining fully black by second year. Voice. At least 15 distinct calls identified. Only well-studied call the alarm call, or "chatter", a graded call of variable



length and intensity that reflects caller's motivation: "basic chatter" a harsh rattle lasting minimum of 0·12 seconds, used for assembling individuals around ground or perched predator or dead conspecific; "staccato chatter" a more general alarm that disperses magpies from immediate area, given to warn of aerial predator. Many other tweets, trills, coos, purrs, squawks, shrieks, screams and yelps described for *P. pica* and likely used by present species. A soft "shrill" call given only by female in response to mate returning with food. Female utters (from two days before egg-laying) loud, high-pitched whining cries ("clear call") while crouched and flapping wings to beg from mate. Three renditions of singing are recognized (babble, soft, and rhythmic singing); song given mostly by male during courtship or assertive behaviour, even towards intruding predators or people. Between partners a "chirp" (female) and "crunch" (male) given. Mimicry recorded in captivity, but apparently not in wild.

Habitat. Arid shrub-steppe, favouring landscapes with clumps of shrubs and trees along rivers and streams, on islands, or interspersed in more open meadow, grassland and sagebrush (*Artemisia*) areas. Dry, open pine (*Pinus*) forests and suburban areas in and adjacent to shrublands readily used. Forest edges and suburban or agricultural settings used, especially in N part of range. Common in farm and rangelands that maintain scattered trees and hedgerows. Generally in cooler climate than that tolerated by *P. nuttalli*.

Food and Feeding. Omnivorous. Eats carrion, also invertebrates, including ground beetles (Coleoptera), grasshoppers (Orthoptera), worms (Oligochaeta), also small vertebrates, occasionally as large as rabbits (Leporidae); preys on bird eggs and nestlings, and occasionally catches small adult birds on the wing; some plant material taken. Generally considered more of a scavenger and predator than is *P. nuttalli*. Nestling diet primarily ground-dwelling invertebrates. Scatterhoards abundant foods, mainly carrion and plant material, for short periods (behaviour possibly facilitated by well-developed hippocampus); olfaction utilized to recover and steal caches. Forages alone or in small flocks, mainly on ground. Picks food from ground, or digs into soil and litter, flips over cow dung; also flycatches, and hunts from perches; gleans insects, especially winter ticks (Ixodoidea), from backs of ungulates. Closely associated with predators, from which it scavenges and steals. Precedes and outmanoeuvres larger scavengers such as ravens (*Corvus*) and canids at roadkills and at kills made by grey wolves (*Canis lupus*).

Breeding. Nest-building from late Jan/Feb (later in higher and more N parts of range; relatively earlier in suburban areas than in wild lands), and egg-laying from late Mar to early Jun (mostly in mid-Apr). Pair formation occurs in autumn and winter, when many individuals flock together. Forms monogamous, sometimes lifelong pair-bond (divorce rate varies geographically, 8–63%); female solicits extra-pair copulations, against which mate guards, and which other mated males regularly pursue, but extra-pair copulations less frequent than in *P. nuttalli*. Solitary nester, but nests more clumped than those of *P. pica*, average inter-nest distance varies within range 55–300 m (much shorter than that of most *P. pica* populations); defends area of 30–50 m around nest. Nest built by both sexes, female doing most of shaping and lining of bowl, construction work taking c. 43 days, a platform and usually a domed roof of coarse twigs, interior mud bowl lined with animal hair, grass, shredded bark or rootlets (fewer than 2% of nests undomed), placed in great variety of locations typically 1–9 m above ground, depending on available trees or artificial structures (where human persecution exists, nests higher in trees if alternatives available); nest placement may involve local traditions such as use of utility poles and abandoned buildings, coniferous as opposed to deciduous trees, and sites overhanging water; sometimes refurbished old nest reused. Clutch 1–9 eggs, usually 6–7 (number increasing with female age and pair-bond duration); incubation by female alone, starting before clutch complete, period c. 18 days; hatching often asynchronous, chicks brooded by female, fed by both sexes, nestling period 24–31 days; young fed by both parents for up to 6–8 weeks after fledging; in late summer and autumn, juveniles form large flocks of several hundred individuals. Majority of successful nests fledge 3–4 young; starvation is major source of chick death (asynchronous hatching facilitates brood reduction).

Movements. Primarily resident. Some extensive movements outside breeding season, breeders returning each year to within a few hundred metres of previous nest; wanders in some winters to Pacific coast, upper Midwest, and S Texas. Local post-breeding movements include altitudinal shift (upslope in Idaho, downslope in British Columbia) or movement from inland to coast (e.g. British Columbia). Large flocks observed unpredictably in new areas (e.g. 1500 individuals in Death Valley in 1919). Dispersal of juveniles greater than for *P. pica*, and similar to that of *Perisoreus canadensis* in that dominant siblings disperse less than do subordinates; thus, in S Idaho, males (dominant over females) disperse on average 560 m and females 1034 m; dispersers may travel widely, movements of 354 and 580 km recorded.

Status and Conservation. Not globally threatened. Locally common. Populations currently stable or slightly declining. Range appears limited by climatic factors, especially temperature and humidity; high temperature and high humidity keep species W of 100° W, and extreme heat in S part of range limits species to elevations above 480 m. Breeding density varies, generally 2–35 pairs/km², but up to 200/km² in parts of S Idaho; home range c. 40 ha. In last several centuries, this species has certainly declined and its range contracted as wild bison (*Bison bison*) were nearly extirpated, poisons were widely dispersed to kill wolves and coyotes (*Canis latrans*), and extensive areas of shrub-steppe were converted to monocultures of intensively farmed row crops. Locally, some populations have increased in areas where grasslands have become savannas with trees, contiguous forests have become fragmented, and agriculture and urban sprawl have supplemented food availability while maintaining nesting habitat (e.g. in Minnesota, Arizona, Alberta, and Owens Valley of California). Despite being widely distributed, this corvid is vulnerable to poisons, habitat loss through development and agriculture, and exotic and increasingly common diseases (e.g. West Nile Virus) throughout range.

Bibliography. Anon. (2000a), Birkhead (1991), Birkhead *et al.* (1992), Bolen *et al.* (2000), Buitron (1983a, 1983b, 1988), Buitron & Nuechterlein (1985), Dhindsa & Boag (1990, 1992), Dhindsa *et al.* (1989a, 1989b), Dixon (1933), Dunn & Hannon (1989), Enggist-Dublin & Birkhead (1992), Erpino (1968a, 1968b, 1969), Findholt & Trost (1983), Gerstell & Trost (1997), Hayworth & Weathers (1984), Healey & Krebs (1992), Henny *et al.* (1985), Hochachka (1988), Hochachka & Boag (1987), Hope (1989), Houston (1977), Jones, L.R. (1986), Jones, R.E. & Hungerford (1972), Kalmbach (1927), Kenney & Knight (1992), Klicka & Zink (1997), Knight (1988), Knight & Fitzner (1985), Komers (1989), Komers & Boag (1988), Komers & Dhindsa (1989), Lee Sang-Im *et al.* (2003), Linsdale (1937), McKinstry & Knight (1993), Miller & Brigham (1988), Moholt (1989), Moholt & Trost (1989), Mugaas & King (1981), Reebs (1986), Reebs & Boag (1987), Reed (1990), Reed *et al.* (1997), Reese & Kadlec (1982, 1984, 1985), Reynolds (1996), Root (1988), Sauer *et al.* (1997a), Scharf (1987), Scharf & Clover (1983), Splendoria (1971), Stevenson (1971), Stone (1991), Stone & Trost (1991a, 1991b, 1996), Todd (1968), Trost (1999), Trost & Webb (1986, 1997), Urquhart & Kuyt (1973), Verbeek (1972b), Wang Xiaohong & Trost (2001), Zink *et al.* (1995).



PLATE 35 ➤



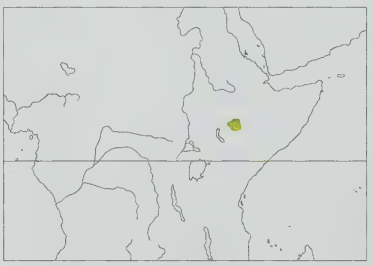
Genus *ZAVATTARIORNIS* Moltoni, 1938

69. **Stresemann's Bushcrow**

Zavattariornis stresemanni

French: Corbin de Stresemann **German**: Akazienhäher **Spanish**: Urraquita de Stresemann
Other common names: Bush-crow, Ethiopian/Abyssinian Bushcrow, Zavattariornis

Taxonomy. *Zavattariornis stresemanni* Moltoni, 1938, Yabelo, region of Borana, southern Ethiopia.
Although long regarded as a member of present family, possesses a number of atypical features, notably its sucking-lice (Mallophaga), and several anatomical peculiarities (including mobility of bare facial skin and structure of palate); has occasionally been placed in monotypic family, Zavattariornithidae, but more recently has been included in starling family, Sturnidae, its small size and sociable behaviour being suggestive of, especially, Wattled Starling (*Creatophora cinerea*). DNA-sequencing analysis, however, supports its inclusion in present family, with closest relatives *Podoces*, *Pica* and the peculiar *Ptilostomus afer*; also, its large domed stick nest is reminiscent of that of some *Pica* species; similarities in plumage colour and pattern have been noted with *Nucifraga columbiana* and *Podoces panderi*, but taxonomic significance doubtful. Monotypic.
Distribution. Small area circumscribed by towns of Yabello, Meega and Arero, in S Ethiopia.



Descriptive notes. 28 cm; c. 130 g. An unmistakable pale grey corvid with striking black tail and wings; relatively long square-ended tail, relatively slight bill with culmen decurving to pointed tip; chin feathers finely hair-like, can form small tuft when erected; bare skin around eye "inflatable" so that eye narrows to horizontal slit, and surrounding feathers and bristles move to expose oblong patch of pinkish skin behind eye. Has head, mantle, scapulars, back, rump and uppertail-coverts delicate light grey, shading whitish on forehead, upper ear-coverts and throat; lesser and median upperwing-coverts grey, contrasting with slightly

glossed blue-black remainder of wing; tail wholly blue-black; chin and throat whitish, breast and flanks pale grey, becoming whitish on rear flanks, tibia, belly and undertail-coverts; iris blackish-brown, bare skin on lores and around eye bright azure-blue, triangular patch of reddish skin behind eye; bill and legs black. Sexes similar. Juvenile is slightly duller than adult, with creamy-fawn fringes on body feathers and lesser and median upperwing-coverts, duller and greyer facial skin, bill and legs. Voice. Very vocal, calling regularly during foraging. Most frequent calls include single metallic "kej" as main contact call, also a nasal, rapid "kerr kerr kerr..." often given in flight. Other vocalizations less obvious or less frequently uttered, include metallic "kaw, kaw, kaw..." by allopreening adults, rapid "how, how, how...", single quiet "quak" notes and low, soft, variably repeated "guw", all given occasionally by foraging flocks; nest-building adults give occasional low "keh", and a single deep "waw" has been heard from adults when rubbing bills together.
Habitat. Flat savanna with mature acacia (*Acacia*) and *Commiphora* thornbush at c. 1300–1800 m. Favours stands of mature thornbush with intervening open short-grass savanna; densities greatest where large stands of acacias close to grazing pasture or cultivated fields. Very scarce in broadleaf *Combretum–Terminalia* woodland. Important factor for this species is presence of relatively deep, rich soil.
Food and Feeding. Almost entirely invertebrates, particularly insects, including larvae and pupae. Forages on ground, strutting about alone, in pairs or in parties of five or six individuals; larger gatherings of up to 20 or even 30 perhaps of a temporary nature. Digs vigorously in soil, with bill held slightly open, often carrying prey item (usually Coleoptera larva or pupa) to nearest tree or bush, where it uses foot to hold down food and then kills and eats it. Also hacks into rotten wood in manner of woodpecker (Picidae) to extricate food items. Inspects cattle dung, but not seen to turn dung over. Once seen to alight on back of cow, presumably to search for parasites. Also forages among village rubbish dumps. During emergences of flying insects, chases insects on foot, running with abrupt changes of direction, and repeatedly undertaking flying jumps; on such occasions mixes with other savanna birds, including Red-billed Hornbill (*Tockus erythrorhynchus*), Red-billed Buffalo Weavers (*Bubalornis niger*), Superb Starlings (*Lamprotornis superbus*) and White-crowned Starlings (*Lamprotornis albicapillus*). Also surprisingly agile in trees, walking along horizontal branches and ascending to crown by quickly hopping from branch to branch; parties glide from crown of tree down to ground. Begins foraging around sunrise.
Breeding. Nest-building seems to be triggered suddenly by first rains of the season in late Feb and early Mar; eggs reported latter part of Mar and early Apr, and large nestlings and many fledglings in early Jun. Monogamous, perhaps with lifelong pair-bond. Solitary or semi-colonial nester; 3–5 pairs nesting within 30–100 m of each other, whereas other nests are more distantly scattered (significance of this variation unclear). An additional individual or, rarely, 2–4 more may join in (or be loosely associated) with nest construction and/or help with feeding of young, but such helpers may not be tied exclusively to one nest as have been seen to fly from one nest to another. Complex social relationships, with frequent allofeeding and allopreening not only between partners, but also among other members of group; further study needed. Once initial twig inserted into crown of an acacia, there is much excited commotion from the paired adults, bare blue facial skin being engorged to alter facial expression, this followed by almost ritualistic picking and dropping of acacia leaves, small twigs and bits of soil, before partners chase each other through tree canopy, carrying nesting material. Nest an untidy globular structure c. 30 cm in height and 60 cm wide, entrance at top, made from thorny twigs, first few twigs fixed in place with clumps of damp soil, cattle dung incorporated later, internal chamber c. 30 cm in diameter, lined with dry grass and cattle dung and connected by vertical tunnel to the tapered roof point; placed 2·5–10 m from ground in crown of acacia; often an old nest repaired and enlarged for reuse. Clutch 6 eggs reported; no information on incubation and fledging periods.
Movements. Sedentary.
Status and Conservation. ENDANGERED. Restricted-range species: present in South Ethiopian Highlands EBA. Fairly common but local, with very small global range. Total population fewer than 10,000 individuals. Extremely limited range, and dramatic decrease over recent decades has prompted the upgrading of this species from Vulnerable to present status. Long considered relatively common in patches over its small range, but it has become evident that habitat destruction is escalating. Increasing human population and settlement of formerly nomadic tribes into permanent villages with private land ownership have led to destruction of natural grassland by overgrazing and intensive planting of cash-crops such as maize (*Zea mays*). Many stands of large acacias have been cut for firewood, and many also cleared for the deep, rich soil in which they grow; this soil is optimum for farming, but also crucial for the bush-crow for foraging. Even at Yabello town, widely considered this species' stronghold, it is now found only in surrounding countryside, whereas only a few years previously it could be found in town centre (town has mushroomed in size to become administrative centre for S Ethiopia). Part of the species' range is within Yabello Wildlife Sanctuary, where tree-felling and tree-cutting prohibited, but such regulations impossible to enforce and are widely flouted. Roadside counts suggest an 80% decrease between 1989 and 2003, which does not bode well for this interesting corvid. Although this dramatic decline possibly in part a reflection of habitat alteration along roads themselves, the species remains under threat from habitat transformation caused by agricultural expansion, tree-felling and bush encroachment.
Bibliography. Anon. (2008p), Ash & Gullick (1989), Benson (1946), Borghesio & Giannetti (2005), Britton *et al.* (1984), Butchart & Stattersfield (2004), Collar & Stuart (1985), Collar *et al.* (1994), Ericson *et al.* (2005), Francis & Shirihai (1999), Fry *et al.* (2000), Gedeon (2006), Goodwin (1986), Hall & Moreau (1970), Hundessa (1991), Lowe (1949), Mackworth-Praed & Grant (1960), Madge & Burn (1994), Moltoni (1938), Stattersfield & Capper (2000), Syvertsen & Dellelgen (1991), Tilahun *et al.* (1996), Urban (1980), Urban & Brown (1971).

Genus *PODOCES*

J. G. Fischer von Waldheim, 1821

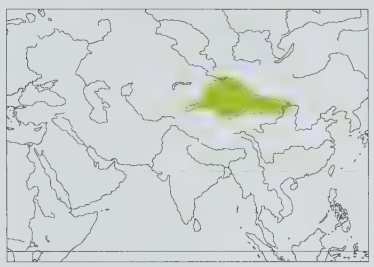
70. Henderson's Ground-jay

Podoces hendersoni

French: Podoce de Henderson **Spanish**: Arrendajo Terrestre Mongol
German: Mongolenhäher

Other common names: Mongolian/Black-tailed Ground-jay, Henderson's Ground-chough, Mongolian Desert Jay

Taxonomy. *Podoces Hendersoni* Hume, 1871, no locality = between Sanju and Koshtak, Xinjiang, China. Forms a species pair with *P. biddulphi*; the two are sometimes united in a separate genus, *Eupodoces*, differing from other two members of genus in having black on crown, relatively long uppertail-coverts and dark legs, and lacking blackish breast patch. Monotypic.
Distribution. SC Russia (Tuva) and W & S Mongolia S to NW & N China (S to Tien Shan, E to NE Qinghai, N Gansu, W Inner Mongolia and Ningxia).



Descriptive notes. 28 cm; 104–140 g. Beautifully patterned little corvid with gently decurved bill, slightly ruffled rear crown, and rather long uppertail-coverts concealing basal half of tail. Centre of crown and nape are glossy black, lores and superciliary area pale sandy; upperparts sandy brown, richest and washed with vinous on scapulars, rump and uppertail-coverts (becoming bleached to sandy-buff overall); apart from sandy-buff lesser and median upperwing-coverts, wing glossy blue-black over inner half (secondaries and coverts, including primary coverts), contrasting with largely white primaries, latter tipped with black and with black bases (some have white tips on outermost secondaries); tail glossy blue-black, outermost feathers with sandy fringes when fresh; sandy buff below, lightest on throat and undertail-coverts; iris dark brown; bill and legs black. Differs from somewhat similar *P. biddulphi* in black (not mostly white) tail, pale (not blackish) face and chin, also (in flight) lack of white trailing edge of secondaries. Sexes similar. Juvenile is similar to adult, but wing dull (not glossy) black, has buff tips on greater coverts in fresh plumage, and black of crown sometimes obscured or dulled by sandy-buff feather tips. Voice. Hardly studied. Calls include harsh penetrating whistle, and a sound likened to the "clack-clack-clack" of a wooden rattle.
Habitat. Flat extensive stony or gravel desert or semi-desert with scattered bushes, e.g. peashrub (*Caragana*), almond (*Amygdalus*) and saxaul (*Haloxylon*), also more locally in sandy deserts with tamarisk (*Tamarix*) thickets. Chiefly between 1000 m and 1700 m, but recorded also down to 200 m in the basins and as high as 3800 m (Xinjiang).
Food and Feeding. Omnivorous. Food during breeding season mainly insects, especially beetles (Coleoptera), and even small lizards recorded; at other times also variety of seeds and other plant materials, and in winter in Mongolia sometimes feeds on meat left to dry on roof of yurt. Digs in soil for insects, especially beetles, for which strong decurved bill useful; also picks seeds from ground or from among animal droppings, and searches along roadsides for spilt grain, maize, wheat, etc. Gait a strutting, almost swaggering walk with upright stance, but, if potential danger threatens, assumes more horizontal posture as it suddenly starts to run; runs well on relatively long legs. Prefers to run, rather than to fly, from potential danger, but will take to the air if hard pressed, flying low just over bushtops, landing and running on again when out of sight.
Breeding. Few nests found. Eggs laid late Mar in W Xinjiang (Kashi) and early Apr in Inner Mongolia (Junggar basin), in China, and late Apr to early May in S Mongolia. Nest a compact bowl of twigs and rootlets, lined with animal hair, feathers and soft plant fibres, well hidden 50–75 cm above ground inside desert bush, more rarely among boulders; one found in Mongolia in Apr 2009 had outer diameter 25 cm, inner diameter 10 cm, exterior made from coarse twigs, interior a neat bowl of fine twigs lined with gazelle hairs, plant fibres and feathers of Pallas's Sandgrouse (*Syrrhaptes paradoxus*), placed 65 cm above ground in saxaul bush. Clutch 3 or 4 eggs; no information on incubation and nestling periods.
Movements. Sedentary, as far as is known. Vagrant to Kazakhstan, with single reliable record in Oct 1962.
Status and Conservation. Not globally threatened. Generally uncommon. In Mongolia not rare, but thinly spread over Gobi desert and in semi-deserts farther north. In China, population studies undertaken in Xinjiang suggest density of c. 5–8 birds/100 km², with estimate of entire Xinjiang population somewhere in region of 50,000 individuals. In Kazakhstan, claimed breeding at L Zaysan is insufficiently documented, and species considered vagrant. Although this corvid's natural predators include large birds of prey, e.g. Long-legged Buzzard (*Buteo rufinus*), Golden Eagle (*Aquila chrysaetos*) and Saker Falcon (*Falco cherrug*), greatest threats involve various human activities. In Xinjiang habitat degradation perhaps the most important overall threat, mining for minerals resulting in destruction of large areas of desert. Overgrazing by domestic camels and goats, and the cutting of scrubby bushes for firewood by nomadic and settled people are also contributing to apparent decline in the species' numbers. Creation of better-quality roads has also taken its toll, as ground-jays forage along roadsides, feeding on roadkill victims and on grain spilt from trucks. Nevertheless, extensive tracts of suitable habitat remain, ensuring its continued survival.
Bibliography. Chen Fuguan *et al.* (1998), Cheng Tsohsin (1976), Dementiev *et al.* (1954, 1970), Goodwin (1986), Lei Jinyu & Liu Yang (2006, 2007), Liu Yang & Lei Jinyu (2005), Londei (2000, 2004), Ma Ming *et al.* (2006), MacKinnon & Phillipps (2000), Madge & Burn (1994), Meyer de Schauensee (1984), Stepanyan (2003), Vaurie (1959, 1964, 1972).

71. Biddulph's Ground-jay

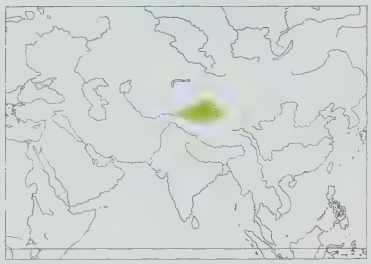
Podoces biddulphi

French: Podoce de Biddulph **Spanish**: Arrendajo Terrestre de Xinjiang
German: Weißschwanzhäher

Other common names: Xinjiang/Sinkiang/Tarim/White-tailed Ground-jay, Biddulph's Ground-chough

Taxonomy. *Podoces Biddulphi* Hume, 1874, Maralbashi, Xinjiang, China.
Forms a species pair with *P. hendersoni*; the two are sometimes united in a separate genus, *Eupodoces*, differing from other two members of genus in having black on crown, relatively long uppertail-coverts and dark legs, and lacking blackish breast patch. Monotypic.
Distribution. Taklimakan Desert (from Yarkand E to Lop Nur) in Xinjiang, NW China.
Descriptive notes. 26·7–31·2 cm cm; male 134–141 g, female 120–132 g. Attractive small corvid with gently decurved bill, slightly ruffled rear crown, and rather long uppertail-coverts conceal-

On following pages: 72. Pander's Ground-jay (*Podoces panderi*); 73. Pleske's Ground-jay (*Podoces pleskei*); 74. Kashmir Nutcracker (*Nucifraga multipunctata*); 75. Spotted Nutcracker (*Nucifraga caryocatactes*); 76. Clark's Nutcracker (*Nucifraga columbiana*).



ing basal half of tail. Centre of crown and nape are glossy black, lores and superciliary area pale sandy; upperparts sandy buff, browner-tinged on scapulars, rump and uppertail-coverts (all becoming bleached to sandy buff); apart from sandy-buff lesser and median upperwing-coverts, wing glossy blue-black over inner half (secondaries and coverts, including primary coverts), contrasting with largely white primaries, latter tipped black and with black bases, secondaries white-tipped (white trailing edge in flight); tail white, some dark markings near feather shafts (appearing essentially white in flight); chin, upper throat and malar region (extending to rear of eye) blackish, finely mottled with pale feather tips (appearing black-throated in field, especially when pale feather tips are worn away), underparts pinkish sandy buff, lightest on undertail-coverts; iris dark brown; bill and legs black. Differs from similar *P. hendersoni* in having black on throat, white tail, white trailing edge of secondaries, slightly slimmer but larger bill. Sexes similar, male somewhat heavier than female. Juvenile is similar to adult, but tail has more extensive, but diffuse, dusky markings and wings are dull (not glossy) black, with buff tips on greater coverts in fresh plumage, the black of crown sometimes obscured or dulled by sandy-buff feather tips. Voice. Hardly studied. Calls include succession of low whistles on rapidly descending scale and a trisyllabic "chui-chui-chui", last syllable of which higher in pitch.

Habitat. Well-vegetated low-lying sandy desert, between 900 m and 1200 m. Favoured habitat is soft sand, forming dunes of varying height (largest exceeding 150 m). Hollows between dunes and dry riverbeds allow access to groundwater in places, permitting growth of desert poplars (*Populus*), tamarisk (*Tamarix*) and even reeds (*Phragmites*), as well as other low-growing plants and shrubs. Readily attends human settlements, including roadworkers' camps, refuse dumps and desert roadsides.

Food and Feeding. Omnivorous, but little studied. Takes variety of seeds, grain and other plant materials; also uses strong decurved bill to dig vigorously in sand for insects, especially beetles (Coleoptera). Picks seeds from among animal droppings, and searches along roadsides for spilt grain and roadkills. Has been observed to cache food items in holes in ground. Observed while drinking from rivers. Perches atop shrubs and trees, dropping to catch a beetle or some other invertebrate before flying off to another bushtop. Normally in pairs or in family parties of up to six individuals; no larger gatherings reported. Gait a typical corvid swaggering walk. Readily takes to air in face of potential danger; flight action rather weak, but often flies considerable distances when flushed.

Breeding. Eggs laid late Mar and Apr. Nest a compact bowl of twigs and rootlets, lined with animal hair, feathers and soft plant fibres, outer diameter 14–55 cm, height 12–35 cm, internal diameter 9–20 cm, depth 5–16 cm, placed 10 cm to 2 m above ground in tree 1·5–10 m tall, exceptionally on ground; one nest was well hidden c. 10–12 cm from ground in a 3-m tamarisk. Clutch 1–3 eggs, usually 3; no information on incubation and nestling periods; both parents seem to accompany family groups for 4–6 weeks after fledging, groups generally breaking up during Jul.

Movements Sedentary, as far as is known.

Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Taklimakan Desert EBA. Described as "common" in Taklimakan Desert during 1929–1930; c. 60 years later, on a visit to several of same sites in Jun 1988, only one group, of six individuals, was observed, perhaps indicating a considerable drop in population. It should be borne in mind, however, that ground-jays are sometimes rather difficult to locate, even in areas where they breed. In recent decades, Tarim Basin is no longer quite so wild and uninhabited as it was in c. 1930. Chinese government's "Go West Campaign" has led to increase in the region's human population from 1,000,000 in 1950 to c. 20,000,000 by 2000. Such fragile habitats as existed in the Taklimakan (a harsh environment, with temperatures ranging from –30°C in Jan to 48°C in Jul) have been heavily degraded by water extraction for irrigation schemes, and by overgrazing by goats and camels. Pressures are numerous, from the collection of medicinal plants and firewood to the numerous traffic kills of the species along the newly constructed Tarim Highway; additional threats include conversion of habitat to cotton and melon fields, direct hunting by migrant workers, and destruction of nests by children and herders. Surveys carried out between 1988 and 2003 indicate, however, a population of c. 8 birds/100 km²; with only c. 40% of the Taklimakan suitable, this suggest a total population of c. 10,700 birds, which is far healthier than had been imagined. Possibly occurrence farther E suggested by a sight record from Golmud, in Qinghai. Such a striking bird would be an ideal figurehead for programmes aimed at conserving parts of the Taklimakan, which has hitherto received no protection. Thirteen areas have been selected as being worthy of special protection, and action should be implemented with much publicity and with an awareness campaign through local schools.

Bibliography. Anon. (2008p), Butchart & Stattersfield (2004), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1976, 1987), Collar *et al.* (1994), Goodwin (1986), Grimmett (1991), Hartert (1903), Lei Jinyu & Liu Yang (2006), Ludlow & Kinnear (1933), Ma Ming (1998, 2004), Ma Ming & Kwok Hon Kai (2004), MacKinnon & Phillipps (2000), Madge & Burn (1994), Meyer de Schauensee (1984), Stattersfield & Capper (2000), Vaurie (1959), Yin Shoujing *et al.* (2005).

72. Pander's Ground-jay

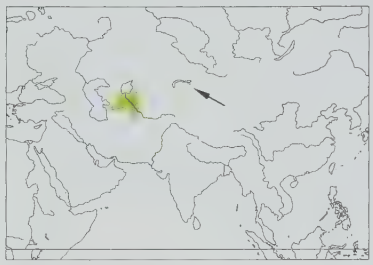
Podoces panderi

French: Podoce de Pander **German**: Saxaulhäher **Spanish**: Arrendajo Terrestre del Turquestán
Other common names: Saxaul Jay, Grey/Turkestan Ground-jay, Pander's Ground-chough

Taxonomy. *Podoces Panderi* J. G. Fischer von Waldheim, 1821, Kyzyl Kum, Uzbekistan.
Forms a species pair with *P. pleskei*, both differing from other two members of genus in lacking black on crown, and in having relatively short uppertail-coverts, pale legs and a blackish breast patch. Birds from Transcaspia described as race *transcaspius* and those from E Kazakhstan (L Balkhash) as *ilensis*, but effects of bleaching and plumage wear render such forms of questionable validity. Treated as monotypic.

Distribution. N & C Uzbekistan, S Kazakhstan and N & C Turkmenistan; also isolated population in E Kazakhstan (S of L Balkhash).

Descriptive notes. 25 cm; 86–96 g. A small, striking corvid with slightly decurved, rather slim bill, relatively short, glossy black uppertail-coverts. Head, neck and upperparts are sandy grey, paling to whitish on throat, small patch of black on lores, widening in front of eye; flight-feathers almost wholly white with black bases, primaries with black tips, tertials black with white border, greater upperwing-coverts white with black bases, median coverts banded black and white, lesser coverts



sandy grey; tail glossy black; underparts rosy grey, paling to whitish on undertail-coverts, black patch at centre of breast; iris dark brown; bill black; legs pale greyish. Sexes similar. Juvenile is similar to adult, but bill pinkish-grey when recently fledged, plumage buffer, less grey, overall, with duller loral patch, lacks breast patch, and sometimes the black patterning of wings is duller and greyer. Voice. Most frequently heard is a series of far-carrying, clear ringing notes, "chweek chweek chweek chweek...", delivered from top of a bush in early mornings, less frequently in evenings. A similar but briefer call, of a different tone, seems to be given in alarm.

Habitat. Sandy desert with small dunes and extensive bushy cover; notably associated with saxaul (*Haloxylon*) bushes, but seems to avoid dense saxaul forest. Favours semi-open sand desert with mix of vegetation, including bushes and scrub of several other desert species, e.g. *Ammodendron*, *Calligonum* and *Atriplex*. Forages also around settlements and roads.

Food and Feeding. Omnivorous, but little studied. Takes variety of invertebrates and seeds of desert plants, grain and other plant materials. In winter diet almost entirely of vegetable matter; in spring and summer primarily carnivorous, taking beetles (Coleoptera), ants (Formicidae), spiders (Araneae) and scorpions (Scorpiones), also small lizards, especially Lichtenstein's toad-headed agama (*Phrynocephalus interscapularis*). Picks seeds from among animal droppings, and searches along roadsides for spilt grain. Stores food items for future use, inserting them in sand, in crevices in bark at base of bushes, or in other crevices. Normally encountered in pairs or in family parties of up to six individuals; no large gatherings reported. Gait a swaggering walk, but runs in face of danger, often balancing its run with loosely opened wings, taking to the air in low bounding short flights. Flight rather weak, but sometimes flies considerable distances, before landing and running on once more. Adaptation to desert existence so perfect that it is said to not drink, and apparently shuns shelter or shade even in heat of day; other reports, however, state that it visits cattle troughs and wells to drink, and in captivity it drinks readily.

Breeding. Season protracted, nests with eggs found from late Feb to late May, optimum period seemingly late Mar and early Apr; single-brooded, but replacement laid if clutch lost. Appears to have long-term pair-bond, partners staying together all year. Nest often has loosely constructed dome of twigs protecting the main structure, latter being a relatively wide and well-constructed bowl of twigs and rootlets, lined with animal hair, rags, feathers and soft plant material, typically well hidden up to 1 m (rarely, to 2 m) above ground in centre of bush or thicket, sometimes on ground or low down in disused building; reports of nesting in holes in ground appear to be erroneous. Clutch 4–5 eggs, rarely 6; incubation by female, commencing when third or fourth egg laid, fed at nest by male, period 16–19 days; chicks fed by both parents, nestling period at some nests 17–18 days; young able to run rapidly before able to fly properly; family-members remain close together for several weeks after fledging. Nests suffer relatively high rate of predation.

Movements. More or less sedentary, but family groups wander the desert throughout winter in search of food and shelter. Movements seem to be more dispersive following prolonged spells of winter weather; when feeding becomes difficult, leaves parts of NW range, retreating into core range or S of normal distributional area.

Status and Conservation. Not globally threatened. Locally common; rare in extreme E of range. Was described as common, in places even abundant, in Kyzul Kum and Kara Kum deserts in 1940s; sample counts included 10 birds/10–12 km travelled in C Kara Kum of Turkmenistan. Isolated population in desert S of L Balkhash, in E Kazakhstan, always considered very small and poorly known; in late 1940s, during a 1000-km journey through this desert, only five individuals "collected", all at same site. This species has evidently decreased considerably in recent decades through habitat loss incurred by construction of Karakum Canal, which took water from rivers feeding Aral Sea and irrigated large tracts of former desert, mainly for cotton production; this has created something of an environmental disaster, as Aral Sea is drying out and salt and other minerals from dessicating former seabed are wind-blown across newly cultivated regions. This corvid is known to be present in several protected areas, most notably in Repetek Biosphere Reserve, in Turkmenistan.

Bibliography. Bardin (1988), Dementiev *et al.* (1954, 1970), Dolgushin *et al.* (1962), Goodwin (1986), Gubin *et al.* (1986, 1990), Hartert (1903), Knystautas & Sibnev (1987), Madge & Burn (1994), Stepanyan (2003), Vaurie (1959).

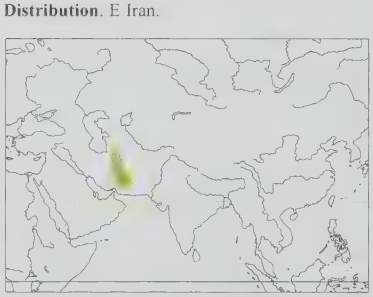
73. Pleske's Ground-jay

Podoces pleskei

French: Podoce de Pleske **German**: Pleskehäher **Spanish**: Arrendajo Terrestre Iraní
Other common names: Iranian/Persian Ground-jay, Pleske's Ground-chough/Groundpecker

Taxonomy. *Podoces pleskei* Zarudny, 1896, Alkhor (= Alghur?), Khorasan, Iran.
Forms a species pair with *P. panderi*, both differing from other two members of genus in lacking black on crown, and in having relatively short uppertail-coverts, pale legs and a blackish breast patch. Monotypic.

Distribution. E Iran.



Descriptive notes. 24 cm; 85–90 g. A boldly patterned small corvid with slightly decurved, rather slim bill, relatively short glossy black uppertail-coverts. Head, neck and both upperparts and underparts are warm sandy buff with pinkish hue, paling to whitish on throat and undertail-coverts; lores black, extending as narrow post-ocular streak, black patch at centre of lower throat widening over centre of upper breast; primaries white over basal two-third and with wide black tips, secondaries glossy blue-black, broadly tipped white; greater upperwing-coverts black with white tips, median coverts banded black and white, lesser coverts sandy buff; tail glossy black; iris dark brown; bill black; legs pale greyish. Sexes similar. Juvenile plumage is poorly documented; lacks black chest patch of adult, and presumably has pinkish bill. Voice. Most frequently heard is a series of far-carrying, penetrating tremulous whistles, "tseee tseee tseee tseee", reminiscent of calls given by Eastern Rock Nuthatch (*Sitta tephronota*); these whistles delivered from top of a bush in early mornings, less frequently in evenings.

Habitat. Sandy desert plains, and both *Zygophyllum* and *Artemisia* steppe, with scattered small bushes and lower-growing plants, especially *Calligonum*, *Salsola* and *Ephedra* (but not one specific shrub in particular). Recorded at 900–2000 m.
Food and Feeding. Omnivorous, diet varying with season. In spring chiefly insectivorous, feeding principally on weevils (Curculionidae) and other beetles (e.g. Tenebrionidae), as well as termites (Isoptera), also occasional small lizard; in autumn, and presumably winter, takes greater variety of plant material, including grains (chiefly barley and wheat), melon seeds and seeds of *Zygophyllum*, and some insects. Observed to hide food items for later consumption; this food-hoarding behaviour makes it an important "planter" of desert shrubs and plants. Normally encountered in pairs or in family parties of up to six individuals; no larger gatherings reported. Behaviour hardly studied, but probably differs little from that of congeners. Most active early morning and evenings, foraging along tracks and in villages and other settlements, looking for grain. Shy and wary in general, but can, exceptionally, become very confiding, even taking food from the hand. Prefers to run, rather than fly, from suspected danger, disappearing remarkably quickly between small shrubs.
Breeding. Eggs laid in first half of Mar; single-brooded. Appears to have long-term pair-bond, partners keeping together all year. Nesting little studied, based chiefly on one active nest. Nest a well-constructed bowl of twigs, lined with soft cotton-like plant materials (apparently lacks dome of *C. panderi* nest), well hidden c. 80 cm from ground in centre of a *Calligonum* bush. Clutch 4–6 eggs; no information on incubation period; chicks fed by both parents, leave nest at c. 15–18 days after hatching and still unable to fly, but run after parents for up to 500 m from nest, finally able to fly at c. 24–28 days; family-members remain close together for several weeks, but seem to disperse in autumn.
Movements. Sedentary; probably some dispersal in autumn–winter.
Status and Conservation. Not globally threatened. Widely distributed over most of interior of E half of Iran, but by no means common; can be locally quite numerous. Found chiefly in Dasht-e Lut of Khorasan and extreme E Kerman, but recorded N to Sharud (in N Semnan), W to Yazd and S to Iranian Baluchistan; one record from Namakazar Basin, on border with NW Afghanistan, and recorded as occurring right up to border with Pakistan at Nokkundi, but presence in Pakistan not yet confirmed. In Jun 1973, 13 individuals (including juveniles) counted along 16-km stretch of the Mashhad–Zahedan highway in the Salahbad area; such density unlikely to be matched other than in prime habitats which have not been grazed by domestic animals. Despite size of country, many areas of desert are quite heavily grazed. This species is known to occur in at least two protected areas, notably Touran (in Semnan province) and Bahram-e Gour (in Fars). Its ability to tolerate salt steppe is a feature very much in its favour, as such habitats not popular for grazing domestic livestock, which otherwise remain the only obvious threat to its future survival.
Bibliography. Evans (1994), Goodwin (1986), Hamedanian (1997), Hartert (1903), Hollom *et al.* (1988), Hüe & Étchécopar (1970), Londei (2001), Madge & Burn (1994), Scott *et al.* (1975), Sehhatisabet (2007), Vaurie (1959), Zarudny (1911).

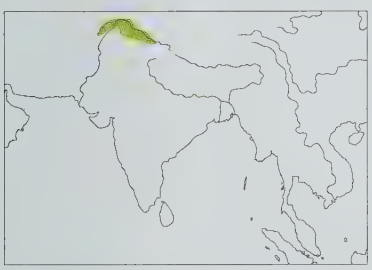
Genus *NUCIFRAGA* Brisson, 1760

74. Kashmir Nutcracker

Nucifraga multipunctata

French: Cassenoix du Cachemire **German**: Himalajahäher **Spanish**: Cascanueces del Himalaya
Other common names: Larger-spotted/Indian/Himalayan Nutcracker

Taxonomy. *Nucifraga multipunctata* Gould, 1849, north of the Pir Panjal Range, in Kashmir.
Usually treated as conspecific with *N. caryocatactes*, but has striking plumage differences from latter (of race *hemispila*), which it seems to replace abruptly in NW Himalayas beyond Pir Panjal Range; this and minor structural differences, and fact that intermediate individuals are extremely rare, suggests that treatment as separate species is appropriate. Monotypic.
Distribution. From E Afghanistan (NE Paktia and Nuristan), N & W Pakistan (Fort Sandeman N along Suleiman Range, Chitral, Gilgit, Baltistan) and Kashmir (Sind Valley, Kishtwar, Badrawar) E into NW India (E to Lahul, in Himachal Pradesh) and possibly adjacent extreme SW Xizang.



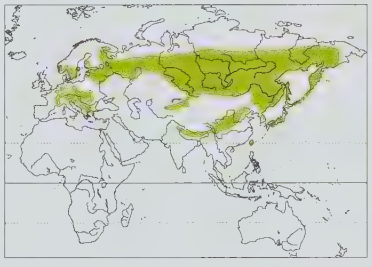
Descriptive notes. 35 cm; 155–177 g. Distinctive corvid with boldly spotted plumage, appearing largely whitish at long range; medium-short tail slightly rounded at corners, relatively slim bill conical and pointed, with straight culmen. Crown and nape are blackish-brown; side of head, neck and most of body plumage blackish grey-brown, profusely and broadly streak-spotted with white (so that dark background colour almost obliterated), rump and uppertail-coverts dark brown with distinct white spots, lower belly and undertail-coverts unmarked white; upperwing glossy black, white spot at tips of coverts and secondaries; tail glossy black, broadly tipped white on central feather pair, white becoming progressively wider towards outermost, which white over distal two-thirds; iris dark brown; bill and legs black. Distinguished from *N. caryocatactes* mainly by bold white spots on rump and uppertail-coverts, more whitish general appearance with contrasting blackish crown, wings and tail base, also slightly larger size, relatively slimmer bill and longer tail. Sexes similar. Juvenile is similar to adult, but wings and tail dull brown (not glossy), ground colour of body plumage lighter brown, wing-coverts with buffy-white tips, and overall impression of softer and looser plumage, particularly undertail-coverts. Voice. Poorly documented, and probably much as for *N. caryocatactes*. Said to have harsh grating calls, also calls like sound of squealing pigs, but latter may refer to food-begging cries from nestlings.
Habitat. Coniferous forest and mixed conifer and oak (*Quercus*) forest where conifers predominate, especially forests of blue pine (*Pinus excelsa*) and Morinda spruce (*Picea smithiana*); mainly 2000–3000 m on alpine slopes, but recorded as low as 1000 m and as high as 4000 m. Often attracted by human habitation, such as villages and encampments.
Food and Feeding. Few data. Conifer seeds taken; in Kashmir, reported as moving our of conifer forests to take walnuts (*Juglans*) and hazelnuts (*Corylus*) for winter caches. Diet and general habits seemingly very similar to those of *N. caryocatactes*.
Breeding. Poorly documented. Season often stated to be May–Jul, but likely to commence egg-laying much earlier, probably late Feb and Mar; breeding season in Afghanistan finished by end of Apr or early May, indicating that eggs must have hatched late Jan or early Feb. Solitary nester. Well-built nest of twigs, decorated with lichens, quite deep cup lined with soft roots and pine needles, placed close against trunk typically 10–30 m above ground in tall, dense conifer. Clutch 3–4 eggs. No other information.
Movements. Resident; descends to somewhat lower levels in late summer to collect nuts for winter stores.
Status and Conservation. Not assessed. Thought not to be globally threatened. Restricted-range species: present in Western Himalayas EBA. Common. Not well known, as formerly considered a race of *N. caryocatactes* and received little study, this partly because its distribution straddles an area of political instability. On slopes of Vale of Kashmir it is tolerably common and seems to adapt well to secondary cutover forest. This species' habit of associating loosely with humans, including foraging by camps and villages, should ensure its future survival.
Bibliography. Ali (1962), Ali & Ripley (1972, 1987b), Bates & Lowther (1952), Goodwin (1986), Madge & Burn (1994), McCarthy (2006), Paludan (1959), Puget (1969), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Stuart Baker (1928), Vaurie (1954, 1959).

75. Spotted Nutcracker

Nucifraga caryocatactes

French: Cassenoix moucheté **German**: Tannenhäher **Spanish**: Cascanueces Común
Other common names: Eurasian Nutcracker; Thick-billed/European Nutcracker (*caryocatactes*); Slender-billed Nutcracker (*macrorhynchos*)

Taxonomy. *Corvus Caryocatactes* Linnaeus, 1758, "Europa" = Sweden.
Usually treated as conspecific with *N. multipunctata*, but striking plumage differences and minor structural differences from latter, which seems to replace it abruptly in NW Himalayas beyond Pir Panjal Range; intermediate individuals extremely rare, suggesting that treatment as separate species is appropriate. Geographical variation rather complex, owing to extensive range and to isolation of several populations. Races fall into two groups, which have in the past been treated as separate species. S races, forming "*hemispila* group" (also with *interdicta*, *macella* and *owstoni*), very weakly spotted overall; isolated *owstoni* of Taiwan quite distinctive, but clearly resembles others of this group, and seems not to have evolved so far towards speciation as have many other Taiwan endemics. W & N races, "nominate group" (with remaining races), encompassing vast range from Norway and France E to Kamchatka and Anadyrland, more heavily marked. Nominate race intergrades with *macrorhynchos* in Urals, and *hemispila* intergrades with *macella* in Darjeeling area of N India. Proposed race *yunnanensis* (from Yunnan, in S China) considered better synonymized with *macella*. Within range of "nominate group" are several populations which have been separated racially on basis of minor differences and are best treated as synonyms: thus, in Europe, *wolfi* (from Balkans) and *relicta* (from Germany S to Serbia) are included in nominate and, in Asia, *kamchatkensis* (from Kamchatka), *altaicus* (from S Altai) and *sassii* (from L Baikal region) treated as synonyms of *macrorhynchos*. Eight subspecies currently recognized.
Subspecies and Distribution.
N. c. caryocatactes (Linnaeus, 1758) – Europe (S Fennoscandia S to SE France, N Italy, Bulgaria and N Greece, E to Ural Mts).
N. c. macrorhynchos C. L. Brehm, 1823 – from Urals E in Siberia to Anadyrland, Kamchatka and Sakhalin I, S to N Mongolia, the Altai, Korea and NE China.
N. c. japonica E. J. O. Hartert, 1897 – S & C Kurils and N Japan (Hokkaido and Honshu).
N. c. rothschildi E. J. O. Hartert, 1903 – Tien Shan from SE Kazakhstan (Dzhungarskiy Alatau) S to C Kyrgystan (Talasskiy Alatau) and extreme NW China (W Xinjiang).
N. c. hemispila Vigors, 1831 –W Himalayas from NE Pakistan (Murree) E, S of the Pir Panjal, to Nepal and N India (Darjeeling).
N. c. macella Thayer & Bangs, 1909 – E Himalayas from E Nepal and Sikkim E to NE India (Arunachal Pradesh), N Myanmar and S & C China (Qinling Mts of S Shaanxi and NW Hubei, S through Sichuan to SE Xizang and Yunnan).
N. c. interdicta O. Kleinschmidt & Weigold, 1922 – E China (SW Liaoning S to Shanxi, N Hebei and Henan).
N. c. owstoni Ingram, 1910 – Taiwan.



Descriptive notes. 32–34 cm; 124–220 g. A medium-sized, rather broad-winged and short-tailed corvid with distinctively spotted plumage (but looking dark at longer ranges). Nominate race has crown and nape very dark brown, darkest on forecrown; sides of head, neck and most of body plumage dark brown, profusely streak-spotted with white, most densely on side of head (giving whitish-cheeked appearance), spots largest but more spaced on scapulars, breast and flanks (forming confluent lines); rump and uppertail-coverts plain dark brown, lower belly and undertail-coverts white; upperwing glossy black, coverts with tiny white spot at tip; tail glossy black with white feather tips, narrow on central pair, becoming progressively wider towards outermost, which look almost all white from below; iris dark brown; bill and legs black. Sexes similar. Juvenile is similar to adult, but wings and tail dull brown (not glossy), median coverts with broad white tip (usually lacking on adult), softer and looser plumage, particularly undertail-coverts. Races form two groups, those in W & N (nominate and first three listed below) all heavily spotted with white on dark brown background and differing from each other in bill shape, those in S (last four) slightly longer-tailed, lack white tips on central rectrices but have more extensive white on outermost, all much browner and with less extensive areas of spotting: *macrorhynchos* differs from nominate in having broader white tailband, also the longest and slimmest bill of all; *japonicus* resembles previous, but has shorter and stouter bill; *rothschildi* has very dark cinnamon-brown ground colour, and stout bill with slightly arched culmen; *hemispila* has reduced spotting, scapulars and flanks virtually unmarked brown, spots most obvious on breast and mantle; *macella* is similar to previous, but individual spots smaller and less numerous; *interdicta* is ill-defined race, differing from last in having lighter brown background colour of body plumage; *owstoni* is dark, sooty brown, but still some contrast with blacker crown, has white spots much reduced, merely flecks on mantle, and tiny white spotting on breast and flanks. Voice. Generally silent outside breeding season, but quite vocal from late winter onwards (breeds early). Typical call a harsh, grating "krraaaaak", quite far-carrying, usually delivered from top of conifer; sometimes quickly repeated into discordant rattle, or abbreviated to weaker "zhreee". Utters a prolonged series of quiet musical notes, including piping, rattling, whining and mewing sounds, interspersed with some mimicry, this complex "song" audible only at close quarters.

Habitat. Coniferous forest and mixed conifer and birch (*Betula*) forest where conifers predominate; from lowlands of taiga, reaching to 4000 m in Nepal. In Continental Europe chiefly in mountain forests, especially where forests broken by clearings and alpine meadows. Prime habitat in Europe composed of Norway spruce (*Picea abies*) and Swiss pine (*Pinus cembra*); mixed forests of silver fir (*Abies alba*), Scots pine (*Pinus sylvestris*), black pine (*Pinus nigra*) and Macedonian Pine (*Pinus peuce*) also important, especially if hazel (*Corylus*) also present. Siberian populations favour cedars (*Cedrus*) and Siberian pine (*Pinus sibirica*), those in E (from Kamchatka S to Japan) linked with Japanese stone pine (*Pinus pumila*) and Sakhalin fir (*Abies sachalinensis*). In Tien Shan, preference is Tien Shan spruce (*Picea tianschanica*). Himalayan populations inhabit mixed rhododendron (*Rhododendron*) and conifer forests, with deodar cedar (*Cedrus deodara*), blue pine (*Pinus excelsa*), Pindrow fir (*Abies pindrow*) and Himalayan fir (*Abies spectabilis*), and Morinda spruce (*Picea smithiana*). Not always restricted to coniferous forests; during periodic irruptions from Siberia, can appear in extremely wide range of habitats, from suburban gardens and parks to tiny offshore islands and desert oases.

Food and Feeding. Main food throughout much of year and in much of range is pine nuts, especially those of Siberian pine; consumes also seeds of various other conifer species, as well as other nuts, especially those of hazel. During spring and early summer takes wide range of invertebrates, including earthworms (Lumbricidae), earwigs (Dermaptera), spiders (Araneae), grasshoppers (Orthoptera), bumblebees (*Bombus*) and wasps (Vespidae); small rodents and small birds also reported as rare prey items. Specialized nut-eater, prominent ridge inside base of lower mandible serving as ideal nut-cracking tool; also, holds cones and other nuts under foot and hammers at them with bill. A compulsive nut-hoarder, storing large quantities of nuts throughout winter territory, carries these in a special sublingual pouch behind the tongue, and stores them in a number of caches at base of tree, behind moss on rocks, crevices in tree bark, or simply on ground near small rock or sapling. Some conifer species lack a "winged" seed casing (which helps the seed to "flutter", thus aiding dispersal), these trees relying on nutcrackers for dispersal of seeds; clearly, this form of interdependence, or mutualism, benefits both the conifer and the bird. Employs several hunting techniques, especially when far from normal habitat during irruptions. Sits high on small tree, dropping to ground in manner of a shrike (Laniidae), or clings to tree trunk to dig into bark crevices in manner of woodpecker (Picidae); reported as following ploughing tractors, clumsily catching flying ants (Formicidae) in mid-air and hovering to get at hazelnuts; hovering over open country when searching for grasshoppers also reported. Has little fear of humans, especially during "invasions"; takes fish heads from fishermen's traps, and will even enter occupied houses, or attend picnics, accepting all manner of household scraps, from cake and pasties to peanuts. Forages among foliage of conifers, sweeping low from tree to tree, often flaring tail after landing (to display white surround); feeds also on ground at base of conifers. Hops, walks and bounds between bouts of probing or hammering into cones. Typically in pairs or in family parties; larger flocks, reaching up to 200 or more individuals, form during periodic irruptions.

Breeding. Breeding commencing even when deep snow on ground; egg-laying begins third week of Mar in Sweden, even earlier in C Europe, where two juveniles reported late Jan (must have hatched late Dec) in Switzerland; peak laying period first week of Apr in SE France, very end of Mar in Balkans; in W Himalayas late Feb seems to be main period, and in W Siberia mid-Apr reported; in Japan, most nests contain eggs in early Apr. Long-term pair-bond, partners staying together all year. Solitary nester. Nest built by both sexes, taking 5–12 days to complete, female doing most of lining of cup; typical corvid nest, a mass of twigs and branches, intertwined with bramble (*Rubus*) shoots and lichens, deep cup lined with soft plant materials, including willow (*Salix*) seeds, mosses and lichens, placed c. 6 m from ground close to main trunk of a conifer. Clutch 2–5 eggs, usually 3 or 4; incubation by both sexes, female doing most (about two-thirds), period 16–18 days; chicks fed by both parents, nestling period c. 23 days; young remain in family group for up to 3 months after fledging; in early Jul most families break up, juveniles having to establish own territory in which to hoard sufficient supplies of nuts to sustain them through forthcoming winter.

Movements. Most populations basically resident, but some, especially when hoarding hazelnuts for winter, move up to 15 km to lower elevations in search of hazel thickets. In severe winter weather Japanese populations descend to lowlands. Mainly resident in C & E Europe, Himalayas, Tien Shan, N China and Taiwan. Populations of race *macrorhynchos* inhabiting taiga zone periodically suffer shortage of pine seed (such crop failures often follow a run of good years of seed production, in which nutcracker populations have done well), forcing large numbers of Siberian breeders to disperse widely in search of food. Irruptions have occurred in Europe on c. 25 occasions in the past 250 years, since the first reference, in 1733. One of the most recent, in 1968, was also one of the most spectacular and well-documented: many thousands were reported as moving S along shores of L Baikal daily from late Jul into early Aug, flocks reaching Gobi Desert and N Kazakhstan, but bulk of the movement was seemingly towards W & SW, thousands invading Europe from E from late Jul onwards; 10,800 moved through NE Germany in early Aug, a total of 6000 was reported from Netherlands, 800 from Belgium and 300 from British Is, several individuals reaching Portugal and NW Africa (a few individuals of nominate race were also identified out of range during invasions, having no doubt been caught up with parties of migrants moving through their locations); ringing recoveries indicated that some *macrorhynchos* turned back on reaching the W, one ringed on coast of Kaliningrad (W Russia) on 1st Aug being recovered c. 2 weeks later 2500 km to E. Although only small numbers overwintered and few were noted on return spring migration, several pairs nested in Denmark, Belgium and Netherlands for several years following the 1968 invasion. Regarded as a rare vagrant in Spain, Portugal, NW Africa, Turkey, Iran and, in Japan, S Kyushu.

Status and Conservation. Not globally threatened. Locally common. Throughout its wide range a relatively conspicuous bird, but remoteness of its habitat gives false impression of relative abundance; overall, numbers fluctuate according to amount of pine seed available in late summer. Reported to be increasing in most European countries, partly owing to creation of extensive plantations of conifers since 1930s, and also to relatively small numbers that stayed behind after 1968 invasion to populate new areas (Denmark, Belgium and Netherlands). European population estimated in 1980s and 1990s at c. 300,000 pairs, of which 3000–5000 in France, 180 in Belgium, 11,000–15,000 in Germany, up to 1000 in Norway, 5000–15,000 in Sweden, 1500–2000 in Finland, 5000–10,000 in Estonia, 5000–20,000 in Latvia, 15,000 in Lithuania, 2000–5000 in Poland, 2500–5000 in Czech Republic, 3000–6000 in Slovakia, 17,000 in Austria, 20,000–30,000 in Switzerland, 10,000–30,000 in Italy, 30,000–70,000 in Romania, 10,000–50,000 in Bulgaria, up to 500 in Albania, up to 600 in Greece, 4000–6000 in Belarus, 8000–12,000 in Croatia, 2000–3000 in Slovenia, 10,000–100,000 in Russia, 200–250 in Ukraine. Bred at at least three sites in 1969–1971 in Netherlands, and up to 10 pairs during 1989–1994 in Denmark. Elsewhere over extensive range generally considered rather common in the appropriate habitat; in Japan considered uncommon and relatively poorly known except in winter, when it leaves Japanese Alps and descends a little lower.

Bibliography. Ali (1962), Ali & Ripley (1972, 1987b), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1976), Coombs (1978), Cramp & Perrins (1994), Crocq (1970, 1974), Dementiev *et al.* (1954, 1970), Érard (1970), Goodwin (1986), Haffer (1993c), Hagemeijer & Blair (1997), Hollyer (1970), Lefranc & Pfeifer (1975), MacKinnon & Phillipps (2000), Madge & Burn (1994), Mattes (1978), McCarthy (2006), Nechaev (1991), Rasmussen & Anderton (2005b), Roberts (1992), Snow & Perrins (1998), Stepanyan (2003), Swanberg (1951, 1956a, 1956b), Tomek (2002), Vaurie (1954, 1959, 1964).

76. Clark's Nutcracker

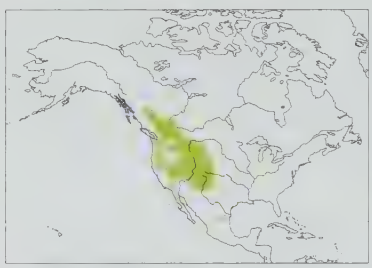
Nucifraga columbiana

French: Cassenoix d'Amérique **German**: Kiefernhäher **Spanish**: Cascanueces Americano

Taxonomy. *Corvus columbiana* A. Wilson, 1811, two miles [3·2 km] north of Kamiah, on Clearwater River, Idaho, USA.

Probably derived from a Siberian form of *N. caryocatactes* which crossed the Bering land-bridge, perhaps as relatively recently as 1·5–2 million years ago. Monotypic.

Distribution. Rocky Mts, Cascade Mts and isolated ranges of W North America from SW Canada (E slopes of interior British Columbia, S & E through mountains of SW Alberta), S in USA to C & E Washington and Olympic Peninsula, Idaho, Montana, Wyoming, W & NE Oregon (likely across the state), N & EC California, Nevada, Utah and Colorado to S California, Arizona and New Mexico; also, in N Mexico, irregularly occurring population in Sierra San Pedro Martír (N Baja California) and isolated population at Cerro Potosí (Nuevo León).



Descriptive notes. 27–30 cm; 106–161 g. A medium-sized corvid with long wings, conspicuous white in wings and tail, and long and sharply pointed bill. Head, neck and most of body are grey (plumage soft and loose), forehead and face varyingly whiter, vent and undertail-coverts white; flight-feathers jet-black, posterior portion of secondaries contrastingly white; central pair of tail feathers black, outer feathers white; iris brown; bill and legs black. Sexes similar, male on average larger than female. Juvenile differs from adult in having mouse-grey body feathers (including face) that are looser, fluffier, and tipped buff; after first moult (completed Oct–Feb) body feathers replaced by adult-like plumage, but most of wing and tail retained so that first-year has lighter-coloured, duller and browner wings and tail, tail tips more rounded and worn, alula conspicuously brown and dull against the few coverts that are moulted; red mouth lining of nestling turns black by end of first year. Voice. Repertoire of 13 calls in three major groups, with considerable variation within and among individuals. Commonly gives sharp, rapid "kraak" or "kraa" calls as contact or flight call; these may be drawn out ("kraaaack" or "kraaaa") over 1 second and audible for more than 1 km for contact or given in rapid series (2–6 calls in 2·4 seconds) for alarm. Mated birds give musical "chirrup" calls to greet one another and other familiar birds, and perhaps to summon juveniles; both sexes beg from mate while crouching and fluttering wings. A slow frog-like rattle ("bullfrog call") given mostly Dec–Jun may facilitate pair-bonding. Mates also give variety of clicks, pops, whistles and crackles either singly (while courting and breeding) or strung together in monologues (usually while alone). Juveniles beg from food-carrying parents with repeated "aaaa" calls. Individuals in proximity to others commonly utter loud "meerk" or "mew" calls mixed with "kraaaack" calls. Lone individuals may trumpet a piercing "bray" call, possibly in defence of territory.

Habitat. Mountain coniferous forests, typically including trees that produce large, wingless seeds, e.g. pinyon pine at lower elevations and whitebark (*Pinus albicaulis*) or limber pines (*Pinus flexilis*) at higher elevations. In Canada and NW USA, nesting habitat commonly open, park-like ponderosa pine (*Pinus ponderosa*); nests also in Jeffrey pine (*Pinus jeffreyi*), grand fir (*Abies grandis*), and mixed coniferous forests including whitebark or limber pines. Tends to be found at highest elevations from mid-summer (early Jun) to autumn (Sept–Nov, depending on latitude and snowfall), in open subalpine to tree-line areas at c. 1800–3400 m, where stands of whitebark, limber, Jeffrey and pinyon pines and bristlecone pine (*Pinus longaeva*, *P. aristata*) are interspersed with shrubs, talus slopes, meadows, creeks and lakes. For late autumn–winter descends to lower-elevation conifer forests where food available. Common at human recreation sites and cabins if birdfeeders or meat scraps provided. Wanders broadly through coniferous forests and woodlands beyond normal range when preferred seed crops fail. Mostly at c. 900–3700 m; in Canada, 0–2600 m in British Columbia and c. 1000–3840 m in SW Alberta.

Food and Feeding. Specialist on conifer seeds, especially large, wingless seeds of pinyon, limber, and whitebark pines, and smaller seeds of ponderosa pine and Douglas-fir (*Pseudotsuga menziesii*). Also, opportunistically takes invertebrates, small vertebrates, and carrion; invertebrates mainly beetles (Coleoptera), bees and ants (Hymenoptera), grasshoppers and crickets (Orthoptera), moths and butterflies (Lepidoptera), flies (Diptera), stoneflies (Plecoptera), and leafhoppers (Homoptera); preys on other birds, ground-squirrels (*Spermophilus*), chipmunks (*Tamias*), voles (*Microtus*) and toads (*Bufo*). Nestling diet shelled pine seeds and some insects. Catches insects by gleaning from vegetation, soil or cones, probing and flaking bark, and flycatching from perch. Forages on green and ripened cones of pines; uses long and pointed bill to pry open green cone scales, probe into open cones, and dig in litter beneath trees to remove and assess the quality of seeds. Viable seeds are cracked in bill, pounded open while held by the feet on a branch or other substrate, or placed intact in the special sublingual pouch in floor of mouth for transportation to caching grounds. Efficiently removes seeds from tightly closed, green cones, taking 30–90 seconds per seed; rapidly removes seeds from open cones, 7–10 seconds per seed. Begins to cache food when pine seeds develop hard coat (days to weeks before cones open); each individual harvests seeds singly from cones and fills the sublingual pouch with up to 95 pinyon or 150 whitebark pine seeds, which it transports up to 8–12 km (whitebark) or 7·5–22 km (pinyon), either upslope or downslope to caching grounds; most seeds transported substantially shorter distances, e.g. average of 27 m for transportation of whitebark pine seeds in a California study. Each nutcracker caches tens of thousands of seeds (22,000–33,000 pinyon, 35,000–98,000 whitebark) each year in holes made with the bill, often at base of existing trees and rocks, on exposed rocky, south-facing slopes, or in bark, logs and stumps; up to 30 (usually 3–4) seeds placed in single cache. Caches from a single trip are often clustered 10–300 cm apart. Consistently outperforms less cache-reliant corvids (*Aphelocoma californica* and *A. ultramarina*) on tasks requiring spatial memory, and is one of few animals to have demonstrated use of basic geometric relationships in controlled laboratory conditions (found caches midway between landmarks, regardless of absolute distance between landmarks); has capacity to learn cache locations by watching others cache, though this observational spatial memory less well developed than in more social corvids (*Gymnorhinus cyanocephalus*, *A. ultramarina*); spatial memory, landmarks and geometric rules allow this species to recover caches months after they are made, even when snow covers caching grounds. Generally observed in pairs or in small groups; also in larger flocks, of 15–80 individuals in loose group, outside breeding season.

Breeding. Few nests observed, as this species often nests in remote settings during severe winter conditions. Nest-building typically begins (at 975–3658 m) in early Mar throughout range, and

laying early Mar to mid-Apr (occasionally from mid-Feb), most young fledging Apr–May; timing of breeding likely tied to previous autumn's cone crop. Pair-bond appears to be maintained throughout year. Nest constructed in 5–8 days, a coarse stick platform 21·6–33 cm in diameter and 11·4–19 cm tall, with well-insulated inner cup (10·2–11·4 cm in diameter, 6·4–8·9 cm deep; 3·8–5·1 cm thick) of soil, bark, moss and animal hair, often placed in clump of conifer trees (often in outer foliage) in protected (leeward and south-facing aspects) setting near seeds stored in previous autumn; in short nest trees e.g. Colorado pinyon (*Pinus edulis*), single-leaf pinyon (*Pinus monophylla*) or western juniper (*Juniperus occidentalis*) nests 2–5 m above ground, in taller trees e.g. Douglas-fir, lodgepole pine (*Pinus contorta*), ponderosa, whitebark and Jeffrey pines, alpine larch (*Larix lyallii*) and spruce (*Picea*) 1·8–24 m above ground; pair defends small territory (one estimated at 0·85 ha) around nest. Clutch 2–6 eggs, normally 2 or 3; incubation by both sexes, period 18 days; chicks brooded by both sexes, nearly continuously for 10–11 days after hatching, fed by both parents, nestling period 20 days; young dependent on parents until 3–4 months old (usually first half Aug), during which fed with cached and sprouting seeds, juveniles learn to find caches by spotting germinating seeds. Breeding success probably tied to previous autumn's cone crop, but this not studied in detail. First breeding begins in second winter. Maximum recorded lifespan 17 years.

Movements. Resident. Some wandering to lower elevations in winter, and periodically when cone crops fail; irregular E to Great Plains of Midwest USA, W to Pacific Coast, N to Alaska, and S throughout N Mexico. Hypothesized that emigration occurs after geographically extensive, synchronous cone-crop failure, and irruptive movements occur when local crop failure follows a year of heavy seed production. Emigration over considerable distances (up to 1800 km) after crop failure results in this species often occurring at unusually low elevations (pinyon–juniper woodland) and invading areas where rarely seen (coastal California and offshore islands, W Ontario, C Alberta, Pennsylvania, Illinois, Arkansas).

Status and Conservation. Not globally threatened. Locally common. Irruptive movements and population responses to varying cone crops make accurate estimation of trends difficult. Wide-scale surveys during 1966–1996 indicated that populations were stable to slightly increasing. Home range used by family group through spring and summer 150–200 ha; when seed crops good, estimated to remain throughout year on home range of 25–150 km². Recent habitat degradation in N Rocky Mts resulting from historical fire suppression, pine beetle (*Dendroctonus ponderosae*) outbreaks, and an epidemic of exotic white pine blister rust (*Cronartium ribicola*) that kills whitebark, limber and southwestern white pines (*Pinus strobiformis*), coupled with extensive loss of pinyon pine woodlands in SW USA to clearance, drought and disease, does not bode well for this species. The ability of pines to develop resistance to these threats and the capacity of nutcrackers to broaden the diet beyond the infected pine species will be crucial to the survival of the pine–nutcracker mutualism, and perhaps ultimately to this nutcracker species itself.

Bibliography. Balda & Kamil (1989, 1992), Balda *et al.* (1996), Baud (1993), Bednekoff & Balda (1996a), Bednekoff *et al.* (1997), Bendire (1889), Benkman *et al.* (1984), Bock *et al.* (1973), Bunch *et al.* (1983), Christensen *et al.* (1991), Contreras-Balderas (1992), Davis & Williams (1957, 1964), Dimmick (1993), Dixon (1934, 1956), Ekman & Ericson (2006), Emery & Clayton (2004), Ericson *et al.* (2005), Espinosa de los Monteros & Cracraft (1997), Evenden *et al.* (1965), Fisher & Myres (1980), French (1955), Furnier *et al.* (1987), Giuntoli & Mewaldt (1978), Hejl (1994), Howell & Webb (1995), Hutchins & Lanner (1982), Johnson *et al.* (1987), Kamil & Balda (1985), Kamil & Jones (1997), Kamil *et al.* (1994), Keane & Arno (1993), Keane *et al.* (1994), Kennard (1975), Lanner (1988, 1996), Lanner & Vander Wall (1980), Linhart & Tomback (1985), Marshall *et al.* (2003), Mewaldt (1948, 1952, 1956, 1958), Mulder *et al.* (1978), Olson (1991), Olson *et al.* (1995), Peterson (1988), Richardson *et al.* (2002), Saunders & Edwards (2000), Tomback (1976, 1977, 1978a, 1978b, 1980, 1982, 1983, 1994, 1995, 1998), Tomback & Kramer (1980), Tomback & Linhart (1990), Tomback & Taylor (1987), Torick (1995), Vander Wall (1982, 1988, 1990), Vander Wall & Balda (1977, 1981), Vander Wall & Hutchins (1983), Vander Wall *et al.* (1981), Wahl *et al.* (2005), Westcott (1964), Wiltschko *et al.* (1999).


ssp barbarus
ssp pyrrhocorax
78
79
ssp monedula
80
ssp soemmerringii
77
PLATE 36
inches 8
cm 20
83
ssp insolens
ssp splendens
82
81
ssp zugmayeri
85
♂
♀
87
ssp violaceus
84
86
ssp enca
89
90
91
88
92
93
♂
♀
94

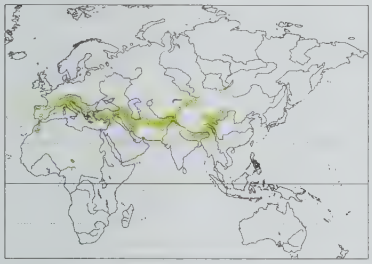
Genus *PYRRHOCORAX* Tunstall, 1771

77. Yellow-billed Chough

Pyrrhocorax graculus

French: Chocard à bec jaune **German**: Alpendohle **Spanish**: Chova Piquigualda
Other common names: Alpine Chough

Taxonomy. *Corvus Graculus* Linnaeus, 1766, Swiss Alps, Switzerland.
Hybrids with *P. pyrrhocorax* very rarely reported. Geographical variation slight; some authorities consider that *forsythi* should be absorbed within *digitatus*. Three subspecies tentatively recognized.
Subspecies and Distribution.
P. g. graculus (Linnaeus, 1766) – Morocco (Rif and Atlas ranges), Spain (Cantabrian Mts, Pyrenees and Sierra Nevada), Corsica, throughout Alps, NC Italy (Apennines), and E through former Yugoslavia, Albania, Greece (including Crete), W Bulgaria and S & E Turkey to Caucasus region and N Iran.
P. g. digitatus Ehrenberg, 1833 – SE Turkey, S to Lebanon and Mt Hermon, E across N Iraq to SW Iran (Zagros Mts).
P. g. forsythi Stoliczka, 1874 – C Asia from C & N Afghanistan NE through Pamirs and patchily on through Tien Shan and Altai to Sayan Mts and, in S, from WC & N Pakistan (including isolated population in N Baluchistan) E in Himalayas to Nepal, Bhutan and Arunachal Pradesh, and C & SW China.



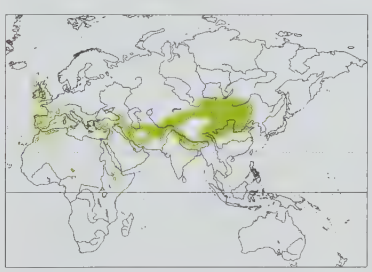
Descriptive notes. 34–38 cm; male 194–277 g, female 160–254 g. Medium-sized, relatively small-headed corvid with fairly long tail, short bill slightly decurved; in flight, rather broad wings with "fingered" primaries, trailing edge of wing gently S-shaped ("pinched" wing base, shorter inner primaries), flight often gamboling in updrafts of air over sheer cliff faces and ridges, swooping and diving, soaring and sweeping down slopes. Nominate race has entire plumage black, weakly glossed bluish-green, most strongly on wings and tail; iris dark brown; bill lemon-yellow; legs bright red. Distinguished from *P. pyrrhocorax* by smaller, yellow bill, base of lower mandible less feathered (and velvety black nasal tuft inconspicuous), shorter legs, wingtips falling well short of tail tip, in flight by relatively longer tail, narrower wings less rectangular in shape and with less strongly fingered primaries. Sexes similar. Juvenile has plumage (when recently fledged) dull sooty black, bill dull horn-coloured, legs black or dark brown, legs becoming red during first winter. Races differ in size and in relative toe and tarsus lengths, nominate race smallest; *forsythi* is largest; *digitatus* is intermediate between previous and nominate.
Voice. Typical call distinctive and unlike that of other corvids, including *P. pyrrhocorax* (although not unlike call of Ethiopian race *baileyi* of latter). Most frequently heard is a sweet rippling "preeep" and a descending whistled "sweeeooo", both given with varied emphasis, the whistled note sometimes similar to a high-pitched, sweeter version of alarm call of *P. pyrrhocorax*. Also gives harsh rolling "churr". Song a subdued warbling, chittering and squeaky series of notes, often uttered by birds when feeding or when resting together.
Habitat. High-altitude mountain pastures with rocky crags above tree-line, descending into upper valleys in winter. Unlike *P. pyrrhocorax*, is very much a scavenger about human habitation, especially so about ski resorts in Europe, where breeds chiefly between 1260 m and 2880 m, but reported as low as 600 m in Balkans. In N Africa nests at 2880–3900 m, and farther E most numerous between 3500 m and 5000 m in Himalayas, where reported as following climbers as high as 8235 m in Nepal.
Food and Feeding. Primarily invertebrates in spring and summer, with more varied diet in autumn and winter. In summer grasshoppers (Orthoptera), beetles (Coleoptera) and larvae of craneflies (Tipulidae) important, but takes whole range of invertebrates, including small molluscs, dragonflies (Odonata), bugs (Hemiptera), caterpillars (Lepidoptera) and ants (Formicidae); will also take small amphibians and reptiles, nestling small birds, eggs and small rodents. In autumn and winter extensive range of seeds (including those of grasses), berries and fruits are added, notably those of rose (*Rosa*), rowan (*Sorbus*), sea-buckthorn (*Hippophae*), juniper (*Juniperus*), cherries and blackthorn (*Prunus*), barberry (*Berberis*), ivy (*Ilex*) and dogwood (*Cornus*). Wide range of discarded human food items recorded, including mashed potato and cheese, and is especially fond of sultanas. Habitually hides food, particularly food scraps, by pushing morsels into rock crevices and under stones. Flocks scavenge about mountain villages and ski resorts, in winter descending to valley bottoms and foraging around towns (but moving back into mountains to roost). Becomes remarkably confiding, following mountain walkers for scraps, even catching food items in air when thrown by humans, or taking food from the hand. Flaps clumsily in bushes when feeding on berries, but usually forages on ground, often in flocks of several hundred individuals. Flocks assemble for daytime foraging activities, later breaking up into smaller groups or pairs scattered over feeding area. On ground walks with shuffling gait or hops, with tail somewhat depressed, flicking wings and tail as it calls. Feeds by pecking at surface in manner of a starling (Sturnidae), rather than probing in manner of *P. pyrrhocorax*; will peck at animal dung after it has been turned over by latter. The two chough species often forage together, and one may temporarily join up with flocks of the other. Present species replaces *P. pyrrhocorax* at higher elevations, although considerable overlap exists and latter does not habitually forage around villages.
Breeding. Laying mainly early May to mid-Jun in Europe and Morocco, Jun and Jul in Lebanon and Kyrgyzstan, and breeds Apr–Jun in N Indian Subcontinent; single-brooded. Generally lifelong monogamous pair-bond, partners remaining together throughout year. Solitary nester, but forms loose colonies in areas of high population density; colonial breeding seems to be exceptional, e.g. up to 20 pairs in underground shaft in Bulgaria and 20–25 pairs along 7·5 km of craggy cliffs in Switzerland (closest nests 70 m apart), but inter-nest distance elsewhere in Alps varied from 600 m to nearly 5 km. Occasionally a helper (probably a youngster of previous brood) assists at nest. Nest built by both sexes, male bringing in materials and female constructing nest, a bulky structure of sticks, roots and similar, lined with grasses, feathers and moss, typically on ledge or shelf near roof of cave or rock chimney, rock crevice or cliff face, especially larger cave with small entrance; roof space of old building, mine-shaft and the like sometimes utilized, although less so than by *P. pyrrhocorax*. Clutch usually 4 eggs, rarely up to 6; incubation by female alone, fed on nest by male, period 18–21 days; chicks fed by both parents, occasionally also by a helper, nestling period 29–31 days; young remain in family group until at least Sept. First breeding at 2 or 3 years of age.
Movements. Basically sedentary; performs daily altitudinal movements from hill ridges to feeding areas lower down in valleys. Ringing studies in Europe indicate that very few move more than 50 km from natal area; maximum recorded movements 85 km and an exceptional 155 km. Vagrants reported from Poland, Czech Republic, Slovakia, Hungary, Cyprus and Balearic Is, but several of these reports probably refer to escaped captive birds.
Status and Conservation. Not globally threatened. Locally common throughout much of wide range; this most noticeable through observations of flocks of non-breeders, generally of 30–200 individuals, but as many as 1000 in winter. European population stable, with reports of increases from many countries, linked with proliferation of winter tourist resorts which has allowed *P. graculus* to scavenge and to remain at higher elevations throughout year. Total European population estimated at 48,000–96,000 pairs (of which 50% are in the Alps): 10,000 in Spain, 17,000 in France, 8000 in Switzerland, 2000–4000 in Germany, 9000 in Austria, 7000 in Italy, 6000 in Croatia, 1000 in Slovenia, 300 in Albania, 8000 in Greece and 2000 in Bulgaria. Became extinct in Poland (Tatra Mts) in middle of 19th century. Decrease reported in Greece. In Morocco uncommon to rare. Precise status in Syria unclear and requires confirmation, but recently been found breeding in mountains of adjacent C Lebanon. Estimated Turkish population at least 10,000 pairs, whereas in neighbouring Armenia only one recent report (flock of 70 in Dec 2000). Considered rare in Azerbaijan, and uncommon in Caucasus, where conspicuous only over highest ridges and passes. Similar comments apply farther E across N Iraq and N Iran, into C Asia and China, where found only around the higher passes (seemingly replaced by *P. pyrrhocorax* at more moderate elevations). Although confiding in presence of human habitation, and reported even as entering tents of climbers, this species only occasionally nests on buildings, preferring inaccessible cliff sites. Within its range and habitat, such sites appear to be secure.
Bibliography. Ali (1962), Ali & Ripley (1972, 1987b), Blasco *et al.* (1980), Bonham (1970), Buchel (1974, 1994), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1976), Coombs (1978), Cramp & Perrins (1994), Delestrade (1994), Dementiev *et al.* (1954, 1970), Dendaletche & Saint-Lebe (1987), Ferguson-Lees (1958), Garcia Dory (1983), Goodwin (1986), Haffer (1993d), Hagemeijer & Blair (1997), Holyoak (1972), Lovari (1976), MacKinnon & Phillipps (2000), Madge (1994), Madge & Burn (1994), McCarthy (2006), Raboud (1988), Rasmussen & Anderton (2005b), Roberts (1992), Rolando & Patterson (1993a, 1993b), Stepanyan (2003), Vaurie (1954, 1959, 1964, 1972), Voisin (1968).

78. Red-billed Chough

Pyrrhocorax pyrrhocorax

French: Crave à bec rouge **German**: Alpenkrähe **Spanish**: Chova Piquirroja
Other common names: Common Chough; Cornish Chough (England)

Taxonomy. *Upupa Pyrrhocorax* Linnaeus, 1758, England.
Hybrids with *P. graculus* reported very rarely. Isolated race *baileyi* differs vocally from others; taxonomic investigation needed. Birds in Inner Mongolia and W Heilongjiang (NE China) of uncertain racial identity, currently included in *brachypus*. Races intergrade, and size tends to increase clinally towards S. Several other races proposed, based on minor differences and/or intermediate populations: *pontifex* (Elburz Mts, in N Iran) and *subdocilis* (Khrebet Mts, on Turkmenistan–NE Iran border) synonymized with *docilis*; and *stresemanni* (Sayan Mts, in S Russia) included in *centralis*. Race *erythroramphos* often misspelt "*erythrorhamphos*". Eight subspecies currently recognized.
Subspecies and Distribution.
P. p. pyrrhocorax (Linnaeus, 1758) – N, W & S Ireland, W Scotland, I of Man, Wales and SW England (Cornwall).
P. p. erythroramphos (Vieillot, 1817) – NE Portugal, Spain, NW & S France, SW Switzerland, C Italy, and Sardinia and Sicily.
P. p. barbarus Vaurie, 1954 – mountains of NW Africa (Morocco and Algeria); also Canary Is (La Palma).
P. p. docilis (S. G. Gmelin, 1774) – S Balkans, Greece (including Crete), and Turkey E to Caucasus, Levant (Lebanon, N Israel, C Syria), N Iraq, N Iran, Turkmenistan and Afghanistan.
P. p. centralis Stresemann, 1928 – NW Himalayas NE through Altai to Mongolia and Buryatia (S Russia) and, in S, E to SW China (SW Xizang), Kashmir and Ladakh.
P. p. himalayanus (Gould, 1862) – Himalayas E to Bhutan and NE India (Arunachal Pradesh) and to C & S China (C Gansu S to Sichuan and Yunnan).
P. p. brachypus (Swinhoe, 1871) – NE & E China (Inner Mongolia and W Heilongjiang S to Ningxia, Shaanxi and Hebei).
P. p. baileyi Rand & Vaurie, 1955 – Simien (and nearby Mt Abune Yosef and Dilenta highlands) and Bale Mts, in Ethiopia.



Descriptive notes. 38–41 cm; 207–375 g. A medium-sized, relatively small-headed and short-legged corvid with comparatively long, slim and gently decurved bill with tip of upper mandible slightly overlapping lower; in flight, rather broad wings prominently "fingered", distinctly buoyant and bounding flight often interspersed with tumbling, swooping and diving, or simply soaring and gliding. Nominate race has entire body plumage glossy blue-black, glossed greenish on wings and tail; iris dark brown; bill scarlet; legs bright red. Sexes similar. Juvenile has plumage (when recently fledged) duller, less glossy, black than adult's, bill shorter and initially dull orange, becoming red by first autumn, legs dusky to pinkish, becoming

On following pages: 79. Piapiac (*Ptilostomus afer*); 80. Eurasian Jackdaw (*Corvus monedula*); 81. Daurian Jackdaw (*Corvus dauuricus*); 82. House Crow (*Corvus splendens*); 83. New Caledonian Crow (*Corvus moneduloides*); 84. Slender-billed Crow (*Corvus enca*); 85. Piping Crow (*Corvus typicus*); 86. Banggai Crow (*Corvus unicolor*); 87. Flores Crow (*Corvus florensis*); 88. Mariana Crow (*Corvus kubaryi*); 89. Long-billed Crow (*Corvus validus*); 90. White-billed Crow (*Corvus woodfordi*); 91. Bougainville Crow (*Corvus meeki*); 92. Bismarck Crow (*Corvus insularis*); 93. Brown-headed Crow (*Corvus fuscicapillus*); 94. Grey Crow (*Corvus tristis*).

red by first autumn. Races differ mainly in intensity of plumage gloss and overall size, coastal races generally smaller than mountain forms, nominate smallest: *erythroramphos* is very close to nominate, but slightly larger and with greener gloss, although birds in NW France (Brittany) somewhat intermediate; *barbarus* is largest of W races, with greenest gloss and strongest and longest bill; *baileyi* is as large as previous, but has weaker bill and almost unglossed plumage, is also relatively short-tailed (primary tips projecting beyond tail tip when on ground); *docilis* is similarly large, but has weaker, shorter bill and whole plumage washed (rather than glossed) with green; *himalayanus* is largest race, glossed blue or bluish-purple (rather than green), is also relatively longer-tailed than most of others; *centralis* has even longer tail, but is smaller, and has only weak bluish plumage gloss; *brachypus* has very weak purplish gloss and relatively the shortest bill of all races. Voice. Typical call a wheezy, hoarse "chaw" or a fading "ch'waa", delivered with explosive quality; very similar to call of juvenile *Corvus monedula* but less flat in tone. Several other calls basically variations on this theme, but alarm a more distinctive harsh, screeched scolding "ker ker ker" or single "karr". Soft, low warbling and chittering sounds reported as uttered by pair-members when relaxing together. Ethiopian race *baileyi* (at least in Bale Mts) seems to lack typical "chaw" of other races, and to be relatively more quiet; calls squeakier, and include trilled, watery "rheeep" and short, weak and rather dry "ka", thus vocally closer to *P. graculus* than to other races of present species.

Habitat. Occupies two habitat zones: coastal cliffs in W Europe, and high mountain pastures with rocky crags elsewhere. Coastal populations (Ireland, Britain, Brittany, Canaries, NW Spain) favour sea cliffs with rocky crags, interspersed with closely grazed grassland. Inland populations found in high mountain pastures above tree-line, in Europe favouring sheep-grazed slopes, farther E also associated with grazing yaks (*Bos grunniens*) and ponies. In Atlas Mts of N Africa most numerous between 2000 m and 2500; in Himalayas favours range 2400–3000 m, but ascends to 6000 m in summer and reported as high as 7950 m on Mt Everest. Less directly human-orientated than is *P. graculus*, but attends grazing stock and is sometimes attracted to human habitation for nest-sites; forages in grassy areas within towns, often nests in buildings in use (Bhutan and Tibet), even on modern buildings in heart of some cities (Ulaanbaatar, in Mongolia).

Food and Feeding. Primarily insectivorous, almost entirely so in spring and summer. Larvae of craneflies (Tipulidae) important, along with small beetles (Coleoptera), caterpillars (Lepidoptera) and ants (Formicidae); wide variety of other invertebrates identified as food items, including woodlice (Isopoda), harvestmen (Opiliones), fly larvae (Diptera), spiders (Araneae), grasshoppers (Orthoptera), bugs (Hemiptera), earthworms (Lumbricidae), and sometimes even scorpions (Scorpiones); rarely, small vertebrates such as lizards (Lacertidae), a mouse (*Mus*) and a shrew (Soricidae), and exceptionally carrion recorded. In autumn and winter, when invertebrate food more difficult to find, takes grain, seeds and small berries, including those of rowan (*Sorbus*), pear (*Pyrus*), juniper (*Juniperus*), sea-buckthorn (*Hippophae*) and olive (*Olea*). Food-hiding reported in captivity. Forages on ground in open country, typically in pairs or family parties, but large assemblies (reaching 200 or more individuals) form as groups of non-breeders merge into noisy social gatherings. On ground, hops, walks and runs between bouts of probing or vigorous digging; digging accompanied by wing-flicking and tail-flicking (a good fieldmark, even at distance). In winter especially, forages along tideline, probing seaweed piles for fly larvae and digging in sand for sandhoppers (Talitridae); may dig quite deep pits, tossing soft sand aside and over its back in the process. Reported as standing on backs of domestic animals to search for parasites. Perches on craggy outcrops, walls and buildings, but not on trees or wires. Has been reported as clumsily flapping in foliage of fruiting trees on occasions, and exceptionally as flapping about to perch on flowerheads of artichokes (*Cynara*). On La Palma (Canary Is), seen to take advantage of caterpillar swarm, flapping amid foliage of pine trees (*Pinus*) and even clinging on trunk to pick food items from bark fissures. Turns over dung and small stones in search of invertebrates; can turn relatively larger stones by reaching forwards and pulling back with stone against chest.

Breeding. Laying mainly middle to late Apr in Britain and Ireland, early May in S France, and late Apr to May in W China and Caucasus; single-brooded, exceptionally two broods in a season; some pairs "skip" a breeding season. Monogamous, generally with lifelong pair-bond, partners remaining together throughout year; first-year and second-year pairings can be short-term until preferred partner located. Solitary nester, but in areas of high population density (as in parts of W China) forms loose colonies; average inter-nest distance in Britain 1·4 km. Occasionally a helper (probably young of previous brood) assists at nest. Nest, usually instigated by male, but finished by female, a mass of sticks, thickly lined with wool, rarely all wool, built typically in roof of cave or rock chimney, or disused quarry, but equally in roof space of disused building, old mine shaft or similar site, also in roof space of inhabited house, monastery or dzong; rarely, may excavate hole or cavity up to 1 m in depth in soft sandstone cliff. Clutch usually 4 eggs, rarely up to 6; incubation by female alone, fed on nest by male, period 17–21 days; chicks fed by both parents, occasionally also by a helper, nestling period 36–41 days; young remain in family group for up to 50 days after fledging; in late autumn families gather into flocks to prepare for winter foraging, or communal roosting. Rarely, nest parasitized by Great Spotted Cuckoo (*Clamator glandarius*).

Movements. Basically sedentary. Ringing studies in Britain suggest that young disperse over short distances, rarely more than 10 km from natal site; exceptional movements recorded, the longest an individual which moved from Bardsey (off NW Wales) to Liverpool, a distance of 142 km, and another of 150 km within Wales. Unringed vagrants have turned up on Orkney, 360 km from nearest breeding sites, and E England (210 km). A succession of vagrants in Cornwall since 1986 resulted in tiny breeding toehold being established, heralding the first nesting in England for nearly 50 years. Two records of vagrants in Germany since 1977, and others reported from Slovakia, Hungary, Balearic Is and Israel. European inland populations move little, apart from leaving higher elevations after heavy snowfall; in N Spain may descend from mountains to coast during such conditions. Those in Morocco, Turkey, Iran, Afghanistan and W China likewise make altitudinal movements following adverse winter weather.

Status and Conservation. Not globally threatened. Locally common. In much of its wide range there is evidence of a decline in numbers, most evidently in Europe, where populations have become very fragmented. Changes in grazing regimes undoubtedly the most important factor in its demise. In former times grazing animals roamed freely over mountain slopes and coastal cliffs, keeping vegetation short and ideal for invertebrates (essential in diet of young). Populations have become very fragmented in the Alps, where extinct in Austria by end of 19th century, but an isolated population of c. 50 pairs near Valais, in Swiss Alps, with similar numbers in W Italian and French Alps; has disappeared from C & E Italian Alps, but a few hundred pairs breed in Apennines and Sicily, with very small population on Sardinia. In NW France, had disappeared from Normandy by 1910, but c. 30 pairs survive in Brittany (chiefly on island of Ouessant). Following a long decline, which resulted in loss of entire English and most of Scottish populations, this species now doing well in Britain and Ireland, with c. 1000 pairs, with local increases perhaps most marked on I of Man, and has started to recolonize Cornwall, where three pairs nested in 2008 (the only ones in England); part of the recovery of British choughs due to a programme of rough grazing along coastal slopes and the erection of nestboxes in suitable caves or old buildings. Spain, with 8000 or so pairs, has one of highest populations in Europe, with some local increases since 1970s; in adjacent Portugal just over 100 pairs at five sites; on La Palma (Canary Is) c. 300 pairs. In NW Africa, quite numerous in Morocco, less so in Algeria, and extinct in Tunisia (last nested in late 1800s). In E Europe, at least 3000 pairs in Croatia, an unknown small number in Albania and at least 1500 pairs in Greece, majority on Crete. Widespread in mountains of E Turkey, and probably so in adjacent N Iraq. After absence of records for several decades, has recently been rediscovered in Lebanon and C Syria (Palmyra). Numerous through Caucasus and in Elburz Mts of N Iran, as it seems to be also throughout remaining Asiatic part of range, but disappearance of an isolated population in Urals in 19th century also suggests a contraction (if the species' presence there was undoubted). Isolated populations in highlands of Ethiopia relatively few in number, at least in Bale Mts, where fires have burnt extensive tracts of the tundra-like landscape.

Bibliography. Ali (1962), Ali & Ripley (1972, 1987b), Bannerman (1954), Bignall & Curtis (1988), Blanco *et al.* (1993), Bonham (1970), Bullock *et al.* (1983a, 1983b, 1983c), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1976), Coombs (1978), Cowdy (1973), Cramp & Perrins (1994), Darke (1971), David & Gosselin (2002a), Delestrade (1998), Dementiev *et al.* (1954, 1970), Farinha (1991), Ferguson-Lees (1958), Garcia Dory (1983), Goodwin (1986), Haffer (1993e), Hagemeijer & Blair (1997), Holyoak (1971, 1972), Kitson (1985), Lovari (1976), MacKinnon & Phillipps (2000), Madge (1994), Madge & Burn (1994), McCarthy (2006), McCracken *et al.* (1992), Meyer (1990, 2000), Monaghan *et al.* (1989), Rasmussen & Anderton (2005b), Roberts, P.J. (1985a, 1985b), Roberts, T.J. (1992), Rolfe (1966), Ryves (1940, 1948), Stepanyan (2003), Tucker & Heath (1994), Vaurie (1954, 1959, 1964, 1972), Williamson (1959).

Genus *PTILOSTOMUS* Swainson, 1837

79. Piapiac

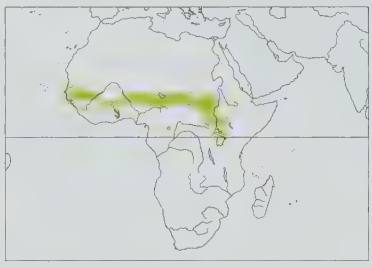
Ptilostomus afer

French: Piapiac africain **German**: Spitzschwanzelster **Spanish**: Piapiac
Other common names: Black Magpie

Taxonomy. *Corvus afer* Linnaeus, 1766, Senegal.

Long, graduated tail, sociable habits and piping calls of this peculiar corvid suggest, as with *Zavattariornis*, an affinity with the starlings (Sturnidae), but DNA-sequencing supports its inclusion in present family, with closest relatives evidently *Podoces* and *Zavattariornis*. Very unusual among passerine genera in having ten (instead of twelve) tail feathers. Monotypic.

Distribution. SW Mauritania, Senegal, Gambia and Guinea Bissau E through N Guinea, N Ivory Coast, S Mali, S Burkina Faso, N & E Ghana, N Togo, N Benin, S Niger and N Nigeria E in narrow band to SW Sudan, thence S to extreme NE DRCongo, Uganda (except SW & E), SW Ethiopia and extreme W Kenya. Also a few old reports from Sierra Leone and one recent record from Liberia, and isolated records from N PRCongo.



Descriptive notes. 35–42 cm; 121–130 g. A rather small-bodied corvid with very long, graduated tail of ten stiff feathers; stout bill with strongly arched culmen, nasal bristles soft and upcurving, overlapping along culmen ridge; feathers of forehead and lores dense and velvet-like. Head and body plumage are black with bluish or purplish sheen, rump and uppertail-coverts dull sooty black; upperwing-coverts, tertials and inner secondaries glossy black, primary coverts, primaries and outer secondaries very dark brown with blacker tips, their inner webs paler brown (light wingpanel in flight); tail dull blackish-brown, lighter on underside, becoming paler brown with wear; underwing-coverts and axillaries sooty black, contrasting with pale grey-brown undersides of flight-feathers; iris violet-blue or purple, with more red-brown outer rim; legs and feet black. Sexes alike. Juvenile has brown iris, is similar in plumage and has a pink bill, with varying amounts of black at the tip; the bill apparently not becoming wholly black until at least a year old. Voice. Party-members keep in contact with loud chattering and scolding "pee-ip, pee-ip, pee-ip" calls uttered in 2–3 seconds, similar to but shriller than calls of Long-tailed Glossy Starling (*Lamprotornis caudatus*); particularly noisy towards roosting time. Also reported is a rather clipped metallic chirrup and a short rasping "kwerr", latter given when disturbed, also a harsh, scolding chatter when alarmed.

Habitat. Savanna with scattered trees and patches of woodland, including areas heavily grazed by both domestic and wild herds; forages in dry cultivation, especially recently harvested large fields. Often around villages and edges of towns, where fond of open grassy areas with stands of *Borassus* and *Hyphaene* palms, such as golf courses and airfields. From sea-level to 1500 m.

Food and Feeding. Omnivorous. Diet includes seeds, berries and fruits, including fruits of oil palm (*Elaeis guineensis*), also spiders (Araneae), and various insects and their larvae, especially beetles (Coleoptera), termites (Isoptera) and bugs (Hemiptera). Feeds primarily on ground in parties of eight or so individuals; sometimes 20–40 or as many as 50 may gather together for a short time. Walks with confident leggy strides, tail often awkwardly askew and dragging, adept at sidestepping, hopping and even jumping into air to catch flying insects, such as emerging termites. Feeds around feet of grazing animals, chiefly domestic herds; readily alights on backs of animals, searching for ectoparasites in manner of oxpeckers (*Buphagus*). Perches on treetops and especially on palms, running and hopping along branches with agility. When flushed, may fly only a short distance, keeping low, often jerking head and scolding intruder upon alighting. If disturbed, whole group may fly up into tops of tall palms, sometimes breaking up to alight in different trees. Perches with tail hanging stiffly down. Leaves communal roost in palm crowns at dawn in order to drink and begin foraging. In heat of day flock retires to rest in shady tree.

Breeding. Poorly studied, although numerous. Season depends on local rains, laying reported Jun–Jul in Senegambia, a little later (Jul–Sept) in Mauritania, Apr–May in Ghana, and Mar–Jun in Burkina Faso, Nigeria and Sudan (also Dec); reported as "nesting" in Nov in Uganda. Solitary nester. No information on extent of pair-bond, but known to be co-operative breeder, with reports of as many as five adults and three immatures feeding nestlings. Nest a rather compact structure of twigs, grasses and strips of palm fibres, placed on earthy foundation, with well-lined cup of palm fibres, or sometimes made almost entirely from palm fibres; placed up to 11 m from ground at base of palm frond, sometimes in fork, favouring *Borassus* and *Hyphaene* palms. Clutch 3–7 eggs; no information on incubation and nestling periods.

Movements. Sedentary over most of range. Some movements suspected in parts of C Africa, where reported as visiting parts of Niger only during wet season. Occurrence of occasional individuals in Sierra Leone and the single Liberian record are difficult to explain unless some movements have

taken place. Occurrence in Kenya sporadic, based on a handful of records of wandering birds from Uganda; in Ethiopia may be only a rare seasonal visitor from Sudan.
Status and Conservation. Not globally threatened. Widespread and common over most of range. One of the most conspicuous birds of the savanna in Senegambia. Seemingly less common and more localized in Burkina Faso and Ivory Coast, and rare and little known in extreme N PRCongo, NE DRCongo, W Kenya and SW Ethiopia. This species' ability to adapt and take advantage of man's agriculture and grazing animals has no doubt benefited it; in Sudan it is perhaps even increasing and may be slowly spreading N.
Bibliography. Bannerman (1948), Barlow *et al.* (1997), Borrow & Demey (2001, 2004), Chapin (1954), Cibois & Pasquet (1999), Ericson *et al.* (2005), Fry *et al.* (2000), Goodwin (1986), Hall & Moreau (1970), Mackworth-Praed & Grant (1973), Madge & Burn (1994), Zimmerman *et al.* (1996, 1999).

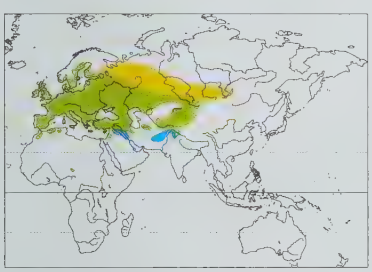
Genus *CORVUS* Linnaeus, 1758

80. Eurasian Jackdaw

Corvus monedula

French: Choucas des tours **German**: Dohle **Spanish**: Grajilla Occidental
Other common names: (Western/Common) Jackdaw

Taxonomy. *Corvus Monedula* Linnaeus, 1758, Europe = Sweden.
This species and *C. dauuricus* sometimes placed together in a separate genus, *Coloeus*. The two form a species pair and are sometimes considered conspecific, but they seem to replace each other geographically in vicinity of L Baikal and N Mongolia, meeting on very narrow front, but with very few reports of mixed pairings. Geographical variation complex, with individual and clinal variation. Other proposed races are *turrium*, *brehmi* and *hilgerti* (all described from Germany), *ibericus* (S Spain) and *nigerrimus* (Morocco), all synonymized with *spermologus*, and *tischleri* (NE Poland), *sophiae* (E Poland), *schluteri* (Belarus), *collaris* (Macedonia), *pontocaspicus* (Cyprus) and *ultracollaris* (Tien Shan), all treated as synonyms of *soemmerringii*. Four subspecies currently recognized.
Subspecies and Distribution.
C. m. monedula Linnaeus, 1758 – Scandinavia.
C. m. spermologus Vieillot, 1817 – W & C Europe from British Is, S to Morocco and NW Algeria.
C. m. cirtensis (Rothschild & E. J. O. Hartert, 1912) – NE Algeria.
C. m. soemmerringii J. G. Fischer von Waldheim, 1811 – E Europe (from S Finland, E Poland, Balkans, Greece, Turkey, Cyprus, and N Israel) E in Asia to L Baikal, W China (W Xinjiang) and Kashmir.



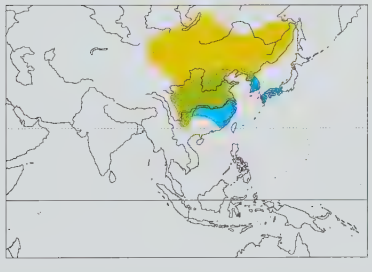
Descriptive notes. 34–39 cm; 136–265 g. Small, sociable crow with moderately long tail somewhat rounded at tip, small and short bill; flattish forecrown, feathers can be raised to form slight mid-crown crest; agile in flight, flocks soar and tumble, pausing to hang over cliff faces. Nominate race has forecrown blackish with slight bluish gloss, rear crown, nape and side of head contrastingly pale grey, distinct whitish collar at base of nape; remainder of plumage dark grey, upperparts with weak bluish sheen, upperwing and tail similar but darker; iris light greyish-white; bill and legs black. Sexes similar. Juvenile has dark iris and entire head and body plumage softer, tinged brownish and without gloss; by first autumn most of head and body plumage replaced and adult-like, contrasting with older (worn) wing and tail feathers; dark iris may persist until end of first winter. Races differ mainly in colour saturation and in prominence of pale collar at side and rear of nape: *spermologus* is darker than nominate, especially on nape, with blacker face, lores and throat, and lacks pale hindcollar or has only weak, diffuse greyish-white line at base of neck; *soemmerringii* is paler grey than previous, especially on nape, and has very distinct pale collar which, in S & E populations, finishes in wider whitish blotch at side of neck ("*collaris*"); *cirtensis* is uniformly slate-grey, with far less contrast on head and nape than other races. Voice. Typical call an abrupt, high-pitched "chjak", given singly, or excitedly repeated 7–8 times as birds meet and form larger groups. In late summer a *Pyrrhocorax*-like "cheeaow" given by recently fledged young, can easily confuse the unwary, but is sooner or later accompanied by "chjak".
Habitat. Inhabits great variety of open country, preferably with scattered trees. Favours mixed farmland, parks and gardens, churchyards, wooded steppe, quarries and coastal cliffs. Avoids both tracts of treeless country and extensive woodland or forests. Ascends to 2000 m in parts of Asia and Morocco; non-breeding birds reported up to 3500 m in Kashmir.
Food and Feeding. Omnivorous, but less of a carnivorous scavenger than most congeners. In one study, 84% of diet plant materials, including grain, seeds and berries, but primarily carnivorous during breeding season. Normal summer diet includes wide variety of invertebrates, e.g. grasshoppers (Orthoptera), ants (Formicidae) and great variety of flies (Diptera); moth caterpillars (especially *Tortrix viridana*) and beetles (Coleoptera) also important components. Some individuals specialize, and become adept at taking eggs of both small and large birds: on Skokholm (Wales) responsible for as much as 60% egg loss of the island's Common Murre (*Uria aalge*) population; others raided burrows of Atlantic Puffins (*Fratercula arctica*) and Manx Shearwaters (*Puffinus puffinus*); in a town in Hungary reported as feeding entirely on eggs and young of Eurasian Collared-doves (*Streptopelia decaocto*); and major egg losses at some Grey Heron (*Ardea cinerea*) colonies have been attributed to this corvid. Such incidents seem unusual, but illustrate the ingenuity of this species; even more strangely, one individuals was watched as it removed bats (Chiroptera) from a tree hole. Also, forages along tideline, primarily for sandhoppers (Talitridae). Takes household scraps of different kinds, and may become cautiously confiding about picnic sites and in city parks. Feeds chiefly on the ground, walking with bold, strutting gait, as it searches for insects; side-hops to catch prey items. Perches on cattle and sheep to feed on ectoparasites. Will fly high during ant emergences of flying ants, catching the ants on the wing. Will pursue other birds to make them drop food items. Sociable; in non-breeding season, large numbers join *C. frugilegus* and *C. corax* on short-cropped grassland and fields and in mixed corvid roosts at favoured woodland sites. Rarely stores food items, and even then seems not to bury them.
Breeding. Laying from late Apr in Britain and N Europe, mid-Apr in C Europe, and first half May in NW Russia and in C Asia and Kashmir. Long-term pair-bond. Semi-colonial, several pairs nesting in close proximity on rooftop chimneys and in quarries and caves. Both sexes take part in construction of nest, which varies in size, but can be massive as fresh nest built each year on top of older ones; foundation a mass of branches and twigs, interspersed with mud and dung, inner cup quite deep and thick, of mosses, rotten wood, feathers and fur and wool, usually in some cavity of some kind, e.g. tree hole, rock crevice in quarry, or in sea cliff alongside Razorbills (*Alca torda*) and Black-legged Kittiwakes (*Rissa tridactyla*), in rabbit (*Oryctolagus*) burrow, chimney, mine-shaft, or bridge; nestbox sometimes used and, rarely, a disused nest of *C. frugilegus* or *Pica pica* may be taken over. Clutch 3–8 eggs, average 4; incubation by female, period 17–19 days, exceptionally 23 days; chicks fed by both parents, nestling period c. 30 days; family-members soon join up with others and form quite substantial summer flocks. First breeding when c. 2 years old.
Movements. In W & S Europe resident or short-distance migrant, some reaching N Africa; native N African populations resident. In Britain leaves higher ground, dispersing SW, many reaching Ireland; occasional massive movements of seemingly displaced birds, as in late Oct 1984, when estimated 20,000 headed N over Cornwall (SW England) after 4000 had arrived on nearby Is of Scilly (where normally a vagrant) for a brief visit. N European breeders may remain throughout winter around human habitations, but others leave during Sept and Oct, dispersing towards SW, including E coast of Britain; individuals ringed in Baltic region have reached France and Italy. C European birds seem to disperse N to Netherlands and adjacent low-lying areas. Those from N of range, particularly W Siberia, move farther, although most winter in S & N Caspian region within S limits of breeding range in C Asia. Peak passage through Chokpak Pass, in W Tien Shan (Kazakhstan), in second half Oct and, in spring, first half Mar; although quite numerous in N Afghanistan in winter, few reach S, some winter in Himalayan foothills of N Pakistan and a few enter plains of NW India. Vagrancy recorded on a number of occasions, stragglers having appeared in Iceland, Faroe Is, Mauritania, Canary Is, Madeira, Azores, Balearic Is, Corsica, Tunisia, Jordan, Tibet and even Japan. Most surprising have been periodic occurrences in E North America, chiefly E Canada, including flock of 52 in Quebec in Nov 1984 (ship-assisted), coinciding with the massive movement over Cornwall (UK) in late Oct of that year.
Status and Conservation. Not globally threatened. Abundant in most of range, but apparent population decreases over recent decades in most European countries. Following estimates (territories/pairs) made for most countries within W Palearctic: Britain 390,000, Ireland 210,000, France 75,000–400,000, Belgium 21,000, Luxembourg 1200–1500, Netherlands 60,000–120,000, Germany 100,000–110,000, Denmark 25,000–140,000, Norway 1000–10,000, Sweden 150,000–500,000, Finland 40,000–60,000, Estonia 30,000–40,000, Latvia 10,000–50,000, Czech Republic 10,000–20,000, Slovakia 3000–5000, Hungary 5000–10,000, Austria 2500–4000, Switzerland 950–1000, Italy 50,000–100,000, Spain 420,000–530,000, Portugal 1000–10,000, Greece 100,000–300,000, Albania 20,000–50,000, Croatia 60,000–80,000, Slovenia 3000–5000, Bulgaria 1,000,000–5,000,000, Romania 40,000–60,000, Russia 1,000,000–10,000,000, Belarus 350,000–400,000, Ukraine 80,000–85,000, Moldova 3500–5000, Azerbaijan up to 1000, Turkey 1,000,000–10,000,000; widespread but localized in Morocco and Algeria. The opening-up of taiga forests of Siberia has permitted this species to breed farther E than previously; in early 1980s found to be not uncommon in Bratsk area and elsewhere in region N of L Baikal. Spreading N through Scottish islands, and now breeding as far N as Shetland. In Malta, where formerly common, is now extinct as a result of persecution. Distinctive race *cirtensis* thought to be extinct in Tunisia, and may be heading that way in NE Algeria (a colony near Ben Harroun was not located in 1989, perhaps displaced by dam construction; 25 had been noted in gorge at Constantine in 1982). Transatlantic vagrants have attempted to breed on more than one occasion, and a pair made unsuccessfully nesting attempt in Iceland in 1977.
Bibliography. Ali & Ripley (1972, 1987b), Arnold & Griffiths (2003), Bährmann (1968), Brazil (1991), Chen Fuguan *et al.* (1998), Coombs (1978), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Dolata *et al.* (2005), Dwenger (2004), Fraissinet (1989), Francis (1998), Fulgione *et al.* (2003), Goodwin (1986), Grimmett *et al.* (1998), Haffer (1993f), Hagemeijer & Blair (1997), Harrop (2000), Heeb (1994), Henderson & Hart (1993, 1995), Henderson *et al.* (2000), Högstedt (1980), Hund & Prinzinger (1981), Johnsson (1994), Johnsson *et al.* (1993), Katzir (1983), de Kort *et al.* (2003), Liebers & Peter (1998), Lorenz (1968b), Madge (1994), Madge & Burn (1994), McCarthy (2006), Meinertzhagen (1926), Morgan & Howse (1974), Partridge & Green (1987), Roberts (1992), Röell (1978), Rosen & Hedenström (2001), Rudolph (2000), Salvati (2002), Smith (1985), Snow & Perrins (1998), Soler, M. & Soler (1991, 1993, 1996), Stepanyan (1990, 2003), Strebel (1991), Töpfer (1999), Vaurie (1954, 1959), Voous (1950), Zimmermann (1951).

81. Daurian Jackdaw

Corvus dauuricus

French: Choucas de Daourie **German**: Elsterdohle **Spanish**: Grajilla Oriental
Other common names: Asian/Pied/Black/Collared/Chinese/Eastern Jackdaw

Taxonomy. *Corvus dauuricus* Pallas, 1776, Transbaikalia, Russia.
This species and *C. monedula* sometimes placed together in a separate genus, *Coloeus*. The two form a species pair and are sometimes considered conspecific, but they seem to replace each other geographically in vicinity of L Baikal and N Mongolia, meeting on very narrow front, but with very few reports of mixed pairings. Dark immature of present species was at one time thought to be a different species ("*C. neglectus*"). Confusing variety of intermediate specimens have also been given names (e.g. *griseiventris* and *nigriventris*) Other synonyms of this species are *fuscicollis* (from Baikal) and *khamensis* (from Xinjiang, in W China). Monotypic.
Distribution. S part of E Siberia from NW L Baikal E to Amurland and Ussuriland (SE Russia), S through Mongolia to E & NE China (E from NE Xinjiang and E Qinghai, S to SE Xizang, Yunnan and Jiangsu). N breeders migrate S to as far as SE China, Korea and S Japan.



Descriptive notes. 34–36 cm; 110–275 g. Small, sociable corvid with moderately long tail somewhat rounded at tip, small and short bill; flattish forecrown, feathers can be raised to form slight mid-crown crest; agile in flight. Crown, face, throat and breast "shield" are glossy black; side of head behind eye black, usually with fine silver-white streaks (but some have only a grey wash over ear-coverts); nape, lower side of head, lower breast and flanks whitish, tinged pinkish-grey when feathers fresh, lower underparts dull grey-tinged whitish, centre of belly, feathered tibia, undertail-coverts and entire upperparts, including upperwing and tail, black; inconspicuous bluish-purple gloss on wings and tail, as well as on crown and throat; iris dark brown; bill and legs black. Sexes alike. Juvenile soon after fledging is pied like adult, but plumage soft, black areas dull sooty black, white areas washed with pale brown,

quite quickly moults into darker first-winter immature plumage; immature has white parts of plumage replaced by dull black, similar to *C. monedula* but dark-eyed, and large glossy black breast shield discernible (merely a diffusely darker throat on *C. monedula*), also rear head and ear-coverts with pale silver streaking but this temporally variable (few or no streaks in autumn and early winter, obvious streaking thereafter); fully adult pied plumage acquired towards following summer; during transitional stages a variety of patchy individuals encountered, e.g. when acquiring adult nape pattern shows whitish first on upper nape (*C. monedula* has narrow whitish collar at base of nape). Voice. Loud "chjak"; calls very like those of *C. monedula*, but perhaps a little less cackling and lower in pitch.

Habitat. Open country, preferably with scattered trees. Large clearings and edges in riverine forest, and rolling steppe with grazing animals and scattered trees (with or without human settlements); even at outskirts of cities. Up to 2000 m in Altai, where it also inhabits cliff faces.

Food and Feeding. Omnivorous; feeds chiefly on seeds and grain outside breeding season, but mostly invertebrates, chiefly insects, during breeding season. Flocks join up with those of *C. frugilegus* or *C. corone* in stubble fields in autumn and winter; large numbers of both species also join other crows in winter at mixed corvid roosts at favoured woodland sites. Also forms more discrete roosts with *Pyrrhocorax graculus* and Hill Pigeons (*Columba rupestris*). Behaviour very much as for *C. monedula*.

Breeding. Laying from mid-Feb in most of Chinese range, much later, late May, in Xizang; mid-May in Tuva (SC Russia). Semi-colonial, several pairs nesting in close proximity in stands of trees, old buildings and cliffs. Builds a stick nest similar to that of *C. monedula*, but favours hollow tree as a site, and perhaps more inclined to build open nest in tangle of branches. Clutch 4–6 eggs; no information on incubation and fledging periods. In breeding condition when c. 2 years old.

Movements. S populations basically resident. N populations migratory, although small numbers may remain about settlements as far N as Ussuriland (in Russian Far East); migrates S & SE towards milder climates, reaching Korean Peninsula and Japan (chiefly Kyushu), but largest numbers wintering along lower Yangtze valley and substantial numbers wintering farther N, in Hebei (E China); young appear to move farther than adults. Flocks of 200–300 individuals pass through Ulaanbaatar region of Mongolia from mid-Mar onwards, and several such flocks in mid-Apr 2007 contained mostly first-winter birds (only 1-2% adults); in autumn, 2876 counted as they flew through C Mongolia in a fortnight from late Sept onwards, with steady passage continuing to at least end of month, also a single flock of 1600 flying S in Ulaanbaatar on 2 Sept 2005; some birds winter in Ulaanbaatar. In Japan winter flocks of 60–90 can be found with *C. frugilegus* on Kyushu. Very rare vagrant in Taiwan and Hong Kong, also in C Ryukyu Is (Okinawa); farther W, presumed vagrants recorded in C Siberia (Krasnoyarsk), Uzbekistan and Kazakhstan, and several times in W Europe.

Status and Conservation. Not globally threatened. Quite common, but hardly abundant. Seems somewhat localized in Transbaikalia, but quite numerous in suitable habitat in Mongolia and N China. Good numbers recorded on passage in Mongolia. In Japan, where formerly a rare winter visitor, numbers have gradually increased.

Bibliography. Brazil (1991), Brouwer & Hallf (1999), Chen Fuguan *et al.* (1998), Coombs (1978), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Goodwin (1986), Jollie (1985), Leader (2003), Liu Yang & Lei Jinyu (2005), Madge (1994), Madge & Burn (1994), McCarthy (2006), Nechaev (1975b), Snow & Perrins (1998), Stepanyan (1990, 2003), Tomek (2002), Ushakova (2004), Vaurie (1954, 1959).

82. House Crow

Corvus splendens

French: Corbeau familier **German**: Glanzkrähe **Spanish**: Cuervo Indio
Other common names: Indian (House) Crow, Grey-necked/Colombo Crow

Taxonomy. *Corvus splendens* Vieillot, 1817, Bengal, India.

Possibly close to, and perhaps an early offshot of, the "*C. macrorhynchos* complex", as suggested by head and bill shape; overlaps with members of that group, but somewhat ecologically separated. Races *zugmayeri* and *protegatus* intergrade with nominate in India. Birds from Maldive Is described as race *maldevicus*, but characters suggest ancestry of mixed races, and perhaps introduced on the islands long ago; considered best treated within *protegatus*. Four subspecies recognized.

Subspecies and Distribution.

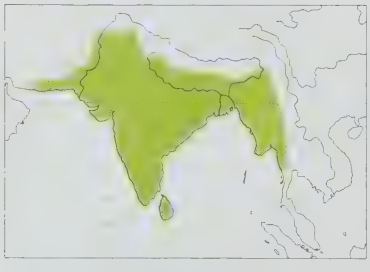
C. s. zugmayeri Laubmann, 1913 – SE Iran and C & S Pakistan E to NW & NC India.

C. s. splendens Vieillot, 1817 – most of peninsular India (excluding NW part and coastal Kerala) and Nepal, Bhutan and Bangladesh.

C. s. protegatus Madarász, 1904 – SW India (S from N Kerala and W Tamil Nadu), Sri Lanka, Laccadive Is and Maldive Is.

C. s. insolens Hume, 1874 – extreme S China (S Xizang and S Yunnan) and Myanmar (including Tenasserim).

Introduced populations (most of which not racially separable, having been brought by ships from several origins) now commonplace at increasing number of towns and ports flanking shores of Indian Ocean and beyond.



Descriptive notes. 40–43 cm; 245–371 g. A relatively small (size not apparent in the field), rather slim-bodied, somewhat "leggy" crow with comparatively long, prominent, slightly arched bill enhanced by short "pinched" forecrown. Nominate race is mostly blackish-slate, blacker and more glossed on face, forecrown, chin and throat; nape to mantle, side of neck and side of breast medium-grey, shading into blackish-grey on lower underparts, and glossy blackish on back, rump and uppertail-coverts; upperwing and tail glossy black; iris dark brown; bill and legs black. Sexes similar. Juvenile is similar to adult but duller, without gloss on black parts of plumage. Races differ mainly in colour saturation (all intergrading): *zugmayeri* is palest, with nape almost whitish-grey; *protegatus* is much darker, with less contrast between nape and body; *insolens* is darkest of all, with even less contrast in plumage (could be confused with smaller races of *C. macrorhynchos*). Voice. Very vocal. Usual call a flat and toneless, dry "kaaan-kaaan", softer than that of Indian forms of *C. macrorhynchos*; also has variety of shorter, nasal calls; notes can be rather plaintive but always dry; calls of race *insolens* said to be higher in pitch than those of nominate.

Habitat. Always found in association with man, in variety of tropical and subtropical habitats. Abundant about human habitation of all types, from city-centre parks to railway stations, sprawling slums and coastal villages. Chiefly a lowland species, but has spread into several hill stations in Himalayas, mainly below 1600 m, but reported at 2100 m in Darjeeling and 2900 m in Sikkim. With increasing military activity in W Himalayas, occasional individuals have appeared around military bases to as high as 4240 m in Ladakh.

Food and Feeding. Omnivorous scavenger, feeding on all manner of crops, invertebrates, vertebrates. Main diet composed of discards and scraps foraged from rubbish dumps, abattoirs and street debris, also street markets and in fishing villages. Eats almost anything, from all kinds of places, ranging from foraging in flowering trees (for nectar) to scavenging for offal; feeds on carrion of all kinds, from dead fish to human corpses on tideline or riverside. Will take fish and insects from water, almost plunge-diving to do so, and undertakes ungainly aerial sallies to take flying ants (Formicidae). Takes eggs and nestlings of many bird species, including larger ones such as herons and egrets (Ardeidae), where it can cause havoc in nesting colonies; likewise with colonies of weavers (Ploceidae), where this crow's agility allows it to gain access to nest-chambers. Attracted to livestock, feeding among feet of cattle, where it steals food items from attendant Cattle Egrets (*Bubulcus ibis*); also rides on backs and necks of large mammals, not only taking ticks (Ixodoidea) and other parasites, but also pecking at open sores. Kills small rodents, and reports of attacks even on human babies, monkeys and cats; kills newborn domestic animals. Does great damage to crops, pulling up seedlings by roots and taking grain and rice from stores. Enters houses to scavenge food. Bold and aggressive by nature, with sociable scavenging habits, but also very wary of humans, in Egypt feeding mostly very early in mornings, spending most of the day at rest, hidden in tree or palm foliage (thus avoiding close contact with man); in most of range, however, displays little fear of man. Always alert, and constantly wary, nervously wing-flicking as it walks or hops on ground. Forms massive roosts, gathering on rooftops in noisy parties prior to flying off towards main roost, where hundreds or thousands may converge, together with large numbers of parakeets (Psittacidae) and mynas (Sturnidae) in plantations or mangroves; just before dawn, flies back to favoured foraging grounds.

Breeding. Season varies according to location, in India as a whole favoured months Apr–Jun, at start of wet season, but younger birds (15–16 months of age) often begin nesting in Oct–Nov; in S, peak in Mar–May in Kerala and May–Aug in Sri Lanka; peak months Oct–Jan on Zanzibar, Oct at Port Sudan, and Apr–May in Kuwait and S Israel; sometimes double-brooded, e.g. in Kenya. Monogamous, with long-term pair-bond, but many individuals are somewhat promiscuous. Solitary nester. Both sexes collect nest material, but normally only female builds, an untidy stick nest generally lined with soft materials gathered from rubbish tips, but stick frame often augmented with metal and wire (including e.g. spectacle frames, coat-hangers, sheet metal, bicycle pedals), and sometimes entire nest made from wire and then often unlined (and can weigh as much as 25 kg), in some cases single large wire nest used by more than one pair; generally placed high in fork of large tree, especially banyan (*Ficus*) or mango (*Mangifera*), but in desert regions often resorts to mangroves and stands of tamarisks (*Tamarix*), and nests also on ledges on buildings, electricity poles and streetlamps. Clutch on average 4 eggs; incubation probably by female alone, although some claims that male relieves female for short spells, period 16–17 days; chicks fed by both parents, nestling period 21–28 days. Nests parasitized by Common Koel (*Eudynamys scolopacea*).

Movements. Resident. Short-distance movements not uncommon.

Status and Conservation. Not globally threatened. Abundant throughout native range; perhaps even more abundant at certain sites where long introduced, either intentionally or by ship-assisted passage. One at Khost in S Afghanistan in 1964 the only record for that country. Race *insolens* formerly extended to SW Thailand, but now only a vagrant there. Introduced populations now commonplace at growing number of towns and ports flanking shores of Indian Ocean and beyond; although some were introduced (e.g. Mombasa and Zanzibar, in E Africa), most originated from ship-borne "stowaways". Once established, colonies spread through towns and into villages, in more arid regions the spread being checked only by absence of human settlements and by desert conditions. Many colonies have reached "pest" proportions, with eradication plans set in motion. In Middle East, colonies exist in SW Iran (Bushire), Kuwait, Saudi Arabia (Jedda, Yanbu), Bahrain, United Arab Emirates, Oman (Muscat), Yemen (Aden N to Hodeidah, a few sites E to Ghaydah), Jordan (Aqaba) and Israel (Eilat); in E Africa from Egypt (chiefly Suez, but also along Red Sea coast), Sudan (chiefly Port Sudan), Djibouti, Eritrea (Assab, Massawa), Somalia (Berbera, Raas Caseyr), Kenya (all along coast, some even Nairobi), Tanzania (chiefly Zanzibar, Pemba, Dar es Salaam), Mozambique (chiefly Inhaca I, also Maputo), South Africa (chiefly Durban, Cape Town); also islands in Indian Ocean, including Seychelles (controlled, but probably still on Mahe and Praslin), Mauritius, Laccadive Is (Kalpeni, Amini and Androth, with later reports from Kadmat and recently introduced Minicoy); in SE Asia on Andaman Is (Port Blair), Peninsular Malaysia (almost throughout lowland W coast, inland to Kulim) and Singapore; recently reported from Sumatra and N Borneo; in Australia has arrived several times, chiefly Perth and Victoria, but shot before becoming established, although individuals reported Melbourne for several years. Reported in ones and twos from other, more temperate, parts of world, including Hong Kong, Japan (Hokkaido), USA (New Jersey, South Carolina, Florida), Gibraltar, Morocco (Tangiers), France (Lille, Lyon), Poland, Hungary, Denmark, Netherlands (Hoek van Holland; first two in 1994, bred in most years 1997–2000, at least ten at roost in Apr 2002), Ireland (Waterford) and even Chile (Punta Arenas); in Hong Kong a substantial increase in numbers of this species has occurred, a flock of 100–200 individuals having established itself in C urban Kowloon. It is widely believed that introduced populations of this crow present considerable problems to humans and native wildlife. In addition to causing ecological damage, it has inflicted economic damage by preying on chicks and eggs of domestic poultry and eating crops such as maize (*Zea mays*) and sorghum (*Sorghum vulgare*), and can become a nuisance to people and present a threat to tourist amenities in some regions. It is known to carry a number of human pathogens, including at least eight human enteric diseases (serotypes of *Salmonella*, *Plesiomonas*, enteropathic *Escherichia coli*, *Shigella* and *Aeromonas hydrophila*), among others (e.g. possibly cholera). Lack of natural predators prevents limitation of this corvid's numbers, and its unsavoury diet and close proximity to humans suggest that human health could be at risk. Control is being attempted in various countries (Aden, Kenya, Tanzania and South Africa) by trapping, poisoning and destroying nests; Australia has a shoot-on-sight policy, which would, it is hoped, prevent the potential destruction of that country's endemic avifauna should this corvid become established there. On Socotra, this species arrived in 1996 and built up a breeding population of more than ten pairs, deemed to pose a threat to the island's native biodiversity; after numerous attempts to trap the crows failed, an imaginative scheme to control their numbers was successful, children being paid a reward for bringing a nest containing young to the Socotra Archipelago Conservation and Development Programme; the last crows were killed by a marksman in spring 2009. In complete contrast, evidence from India, within the species' natural range, suggests that the amount of insects, particularly grasshoppers and locusts (Orthoptera), that these crows consume outweighs the damage that they cause to growing crops.

Bibliography. Angwin (1977), Archer (1994), Ash (1988), Bijlsma & Meininger (1984), Brook *et al.* (2003), Chen Fuguan *et al.* (1998), Cooper (1996), Cyrus & Robson (1980), Feare & Mungroo (1989, 1990), Gallagher & Woodcock (1980), Gill (1985), Harrison *et al.* (1997), Hockey *et al.* (2005), Jennings (1992), Lamba (1963a, 1965), Lekagul & Round (1991), Lever (2005), Madge (1997), Manyanza (1989), Meinertzhagen (1926), Meininger *et al.* (1980), Nhancale *et al.* (1998), Nyári *et al.* (2006), Ottens (2003), Pilcher (1989), Pittie (1988), Rasmussen & Anderton (2005b), Roberts (1992), Robson (2000), Ryall (1974, 1975, 1992a, 1992b, 1994, 1995, 2002, 2003), Sangha & Naoroji (2003), Sinclair (1974), Turnbull *et al.* (2007), Wells (2007).

83. New Caledonian Crow

Corvus moneduloides

French: Corbeau calédonien **Spanish**: Cuervo de Nueva Caledonia
German: Geradschnabelkrähe

Taxonomy. *Corvus moneduloides* Lesson, 1831, no locality = Balab, New Caledonia. Monotypic.
Distribution. New Caledonia. Introduced on Maré, in Loyalty Is.



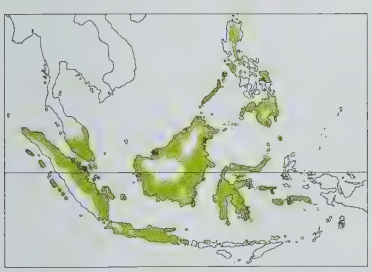
Descriptive notes. 40–43 cm; male 280–355 g, female 225–280 g. Medium-sized, rather long-tailed crow with throat feathers fine and hair-like, short bill is somewhat conical and chisel-tipped. Plumage is entirely glossy black; iris dark brown; bill and legs black. Sexes similar in plumage, male larger than female. Juvenile is similar to adult. Voice. Hoarse, high-pitched cawing notes, soft and drawn out or loud and staccato.
Habitat. Forest, woodland, savanna and plantations.
Food and Feeding. Omnivorous, feeding on adult and larval insects, also fruits, nuts, seeds, flowers, small birds, eggs, snails, carrion and other edible matter. Often in family groups. Foraging methods include hawking for flying insects. Has sophisticated behavioural repertoire; drops nuts on to hard surfaces to crack them, and makes spiked or hooked tools with which to impale or snag and extract prey from crevices. Locally mobile or gregarious, in groups of usually up to eight individuals, rarely up to 30.
Breeding. Season Sept–Jan. Nest a bowl of sticks lined with rootlets, diameter 19 cm, egg-cup 4·5 cm deep, placed c. 8 m above ground on small horizontal branches in outer foliage of mature tree. Clutch 2–4 eggs; no information on incubation and nestling periods.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in New Caledonia EBA. Fairly common. Although it takes eggs and chicks of domestic poultry, this crow is not persecuted on New Caledonia, because it is an endemic species. Introduction on Maré has been detrimental to other birds nesting there.
Bibliography. Chappell & Kacelnik (2002), Doughty *et al.* (1999), Goodwin (1986), Hannecart & Létocart (1980), Hunt (1996, 2000a, 2000b), Hunt & Gray (2002, 2003, 2004), Hunt, Corballis & Gray (2001, 2006), Hunt, Rutledge & Gray (2006), Hunt, Sakuma & Shibata (2002), Kenward, Rutz *et al.* (2004), Kenward, Weir *et al.* (2005), Long (1981), Madge & Burn (1994), Mayr (1945b), Meinertzhagen (1926), Rutledge & Hunt (2004), Stokes (1980), Walters (2005), Weir, Chappell & Kacelnik (2002), Weir, Kenward *et al.* (2004).

84. Slender-billed Crow

Corvus enca

French: Corneille à bec fin **German**: Sundakrähe **Spanish**: Cuervo Picofino
Other common names: Little Crow(!); Violaceous Crow (*pusillus*, *sierramadrensis*, *samarensis*, *violaceus*)

Taxonomy. *Fregilus Enca* Horsfield, 1821, Java.
Until recently *C. unicolor* treated as race of present species. Races form two groups, "nominate group" (also with *compilator*, *celebensis* and *mangoli*) and "*violaceus* group" (including also *sierramadrensis*, *pusillus* and *samarensis*); these may represent two separate species, or possible that races in latter group, which differ vocally, consist of more than one species; further study required. Birds on Mentawai Is (off Sumatra) traditionally included in nominate race, but this seems unlikely; research required. Birds from Banggai Is (off E Sulawesi) included in *celebensis* but may belong with *mangoli*; likewise, birds reported on Karakelong (in Talaud Is) and Siau placed with *celebensis*, but confirmation of race needed. Recent sight record of a family party of crows resembling present species on W coast of Sumba, in Lesser Sundas, may represent an undescribed taxon. Eight subspecies recognized.
Subspecies and Distribution.
C. e. compilator Richmond, 1903 – Peninsular Malaysia, Sumatra (including Simeulue and Nias I, off W coast) and Borneo.
C. e. enca (Horsfield, 1821) – Mentawai Is (off W Sumatra), Java and Bali.
C. e. celebensis Stresemann, 1936 – Sulawesi (and nearby small islands of Manterawu, Manadotua, Lembeh, Bangka, Talisei, Togian Is, Salayar, Basa, Buton, Bonerate and Tukangbesi Group), Banggai Is and Talaud Is.
C. e. mangoli Vaurie, 1958 – Sula Is, off E Sulawesi.
C. e. sierramadrensis Rand & Rabor, 1961 – mountains of N & C Luzon, in N Philippines.
C. e. pusillus Tweeddale, 1878 – Mindoro, Calamian Group and Palawan (and nearby Dadagican and Balabac), in W Philippines.
C. e. samarensis Steere, 1890 – Samar and Mindanao, in S Philippines.
C. e. violaceus Bonaparte, 1850 – Seram and Ambon, possibly also Buru, in S Moluccas.



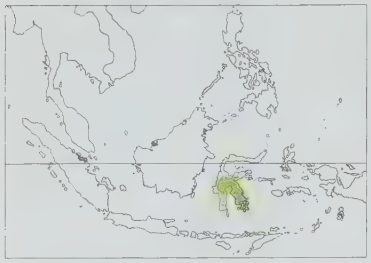
Descriptive notes. 40–47 cm; 222–285 g. Medium-sized, fairly slim crow with medium-length slightly graduated tail, forecrown slightly peaked and inconspicuous throat hackles; in flight relatively broad, blunt wings and relatively short square-tipped tail. Nominate race has head, throat, upperparts, upperwing and tail entirely black, glossed purple-violet, underparts dull matt slate to black, bases of feathers of body white or whitish; iris dark brown, tiny patch of bare black skin behind and narrowly encircling eye; bill relatively long, dagger-like, straight along culmen except for gentle downward curves distally, black; legs black. Distinguished from very similar *C. macrorhynchos* by straighter culmen, slimmer build, with forecrown less peaked and throat less hackled, in flight also by relatively shorter and only slightly graduated tail, shorter hand with primaries less "fingered" (producing distinctly shallower, quicker, wingbeats). Female is like male but on average slightly smaller and weaker-billed. Juvenile has softer and less glossy plumage than adult, iris grey, inside of mandibles reddish-pink (not black). Races differ mainly in size, bill shape, and degree of gloss in plumage, members of "*violaceus* group" smaller and shorter-billed than "nominate group": race *compilator* is larger than nominate, with overall sheen to plumage, including underparts; *celebensis* is more highly glossed overall, has somewhat shorter bill than nominate; *mangoli* is smallest of group, but with relatively longest bill, plumage duller than previous; *violaceus* has culmen gently decurving throughout, plumage matt black with mauve sheen; *pusillus* is slightly larger than last, with relatively slimmer bill, plumage has greyish sheen, especially below; *samarensis* has deeper black plumage, both above and below, than previous, and has purple-blue gloss, especially on upperparts, also bill a little longer and deeper with slightly arching culmen, bases of neck feathers greyish-white; *sierramadrensis* is closest to last, but bill shorter and more slender, with less arched culmen, plumage more intensely black and bases of neck feathers darker grey. Voice. Little variation in "nominate group", a dry "akh-akh-akh" or "ka ka ka-a-a-a", in general calls higher-pitched and have a more nasal, drier quality than those of *C. macrorhynchos*; in excitement often breaks into a series of prolonged caws, interspersed with peculiar resonant, twanging notes (usually also takes to the air with vibrating wingbeats and arched neck). Members of "*violaceus* group" seem to differ from each other more obviously, but human interpretations and transcriptions of vocalizations create room for error: *violaceus* gives up to three simple nasal barks, *pusillus* gives a 3-note nasal "ack ack ack" or "wack wack wack", *sierramadrensis* a slower, lower pitched "waa waa whaaaa" (terminal note slightly inflected downwards), and *samarensis* a deeper "waaa waaa waaa".
Habitat. Lowland broadleaf evergreen forest, both primary and well-grown secondary forest, chiefly below 600 m. Favours extensive forest, and most likely to be encountered where this broken by clearings and other forms of forest edge; often by human settlements, fringes of reservoirs, riverbanks and watercourses. No longer in mangroves in Peninsular Malaysia, where *C. macrorhynchos* common (reports of present species in mangroves in recent years erroneous). In Borneo chiefly in lowland coastal and riverine forests, extending as high as 1050 m in Kelabit uplands. Reaches 1600 m on S Sulawesi, and up to 1000 m on Seram and in Philippines. Where *C. macrorhynchos* absent (Sulawesi) occupies wider range of habitats, including relatively open areas of cultivation and human habitation, with stands of trees, in coastal lowlands.
Food and Feeding. Surprisingly poorly studied. Although omnivorous, fruiting trees provide a major part of its diet; also takes variety of invertebrates, mostly insects, including large beetles (Coleoptera), also small lizards and on occasion feeds on roadkills on forest roads. In Peninsular Malaysia forages in tree canopy for ripe fruits, three species of fig (*Ficus curcubitina*, *Ficus stupenda* and *Ficus subcordata*) identified as a popular food; holds fruits under foot while pecking them open. Chiefly encountered in pairs or family parties, often feeding with other birds in fruiting trees. Also feeds on ground, usually within cover of forest. On Seram, race *violaceus* reported as flocking to feed on fields of ripening maize (*Zea mays*), but such behaviour not reported for other races. Although said to be shy of man, this more likely due to avoidance of habitation, which attracts more successful *C. macrorhynchos*.
Breeding. Not well known. For widespread race *compilator*, eggs recorded in Jun and Jul in Borneo and assumed late Feb and early Mar in Peninsular Malaysia (where nest-building reported first week of Feb, nestlings mid-Mar); eggs in Jun on Seram (race *violaceus*) and Mindoro (race *pusillus*). Generally solitary nester, but "colony" in one "enormous jungle tree" reported on one occasion in Borneo. Nest a rather bulky mass of twigs and sticks, lined with finer materials, placed high in large tree, ideally just inside upper canopy. Clutch on average 2 eggs; incubation probably entirely or mostly by female; chicks fed by both sexes, observation of five visits with food made to nest in one hour (food regurgitated for nestlings); no information on duration of incubation and nestling periods.
Movements. Generally regarded as sedentary; some wandering, as shown by sporadic observations on several Indonesian islands, and recent establishment on Peleng (in Banggai Is) aided by forest clearance and absence of *C. macrorhynchos*. Record of a small family party on W side of Sumba (Lesser Sundas) quite extraordinary and difficult to explain.
Status and Conservation. Not globally threatened. Everywhere rather uncommon; often elusive, favouring confines of quite dense forest, this eases competition from *C. macrorhynchos*, which favours forest edge and patchy cultivation; these habitats used by present species where *C. macrorhynchos* absent (Moluccas). In Peninsular Malaysia considered "Vulnerable, bordering on Endangered"; inhabits forested plains but forest destruction over most of its haunts has caused great fragmentation of its range. In Philippines, Luzon race *sierramadrensis* always considered rare and difficult to find, but recent observations indicate that it is more widespread across hills of N Luzon than was previously thought. Most members of "*violaceus* group" seem to be relatively numerous. Main problem for all races is forest destruction, and in some areas mining. Such activities have opened up large tracts of forest, enabling the larger, less specialized and more successful *C. macrorhynchos* to become established.
Bibliography. Bishop (1992a), Chasen (1939), Coates & Bishop (1997), Dickinson, Eck & Martens (2004), Dickinson, Kennedy & Parkes (1991), Goodwin (1986), Kennedy *et al.* (2000), Londei (2002), MacKinnon & Phillipps (1993), Madge & Burn (1994), Meinertzhagen (1926), Nuytemans (1998), Oortwijn (1987), Rand & Rabor (1961), Robson (2000), Sheldon *et al.* (2001), Smythies & Cranbrook (1981), Vaurie (1958a), Wells (2007), White & Bruce (1986).

85. Piping Crow

Corvus typicus

French: Corneille des Célèbes **German**: Celebeskrähe **Spanish**: Cuervo de Célebes
Other common names: Celebes (Pied) Crow

Taxonomy. *Gazzola typica* Bonaparte, 1853, "Nouvelle Calédonie"; error = Buton Island, Sulawesi. Sometimes placed in separate genus, *Nesocorax*. Forms a species pair with *C. unicolor*, which it resembles closely in structure; until recently, both were thought to belong with the "*C. enca* complex", but differ from that in their behaviour and vocalizations. Monotypic.
Distribution. C & S Sulawesi and smaller islands of Muna and Buton.
Descriptive notes. 35–40 cm; c. 175 g. Unmistakable small pied crow with short tail almost square at tip, medium-length bill with gently curved culmen, nasal bristles conspicuous but culmen ridge bare to base, throat feathers almost hair-like in texture. Head and upper nape are black, glossed bluish-purple, throat dull brownish-black; lower nape, side of neck, upper mantle and underparts to belly white, bases of neck feathers dark grey; lower mantle greyish-black to brownish-black, rest of upperparts, including upperwing and tail, black with blue and purple gloss, lower belly and tibia feathering dull greyish-black or brownish-black; iris dull reddish-brown, tiny patch of bare skin behind eye; bill and legs black. Sexes similar, but female has more diffuse line of demarcation between blackish throat and white breast. Juvenile has white of collar and underparts sullied with greyish-brown. Voice. Very noisy. Variety of rising nasal screams and upslurred piping whistles, often in twos and threes or mixed as a series of 3–5 notes; loud "wheep" seems to be a flight contact call. Also delivers prolonged fine, clear medium-pitched whistle of c. 2 seconds in duration, ini-



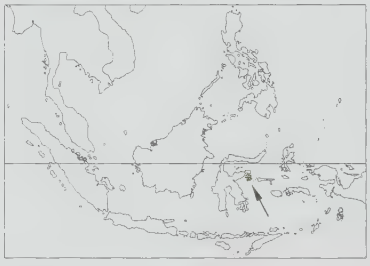
tially dropping in pitch before slowly rising (this note apparently given by two birds simultaneously).
Habitat. Tall secondary and primary tropical forests, both in lowlands and in hills, ascending to 1600 m in NC Sulawesi and 2150 m in S Sulawesi. Forages at forest edge and clearings and locally amid stands of riverine rainbow eucalyptus (*Eucalyptus deglupta*).
Food and Feeding. Various small invertebrates and their larvae; also small fruits, such as figs (*Ficus*). Sociable; typically forages in noisy parties of 4–10 individuals, working through lower to middle levels of forest canopy. Extremely active, dropping and fluttering among foliage, even hanging upside-down. Noisily chases away or mobs birds of prey and other intruders. Flies rapidly and quite directly with shallow whistling beats.
Breeding. No information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Despite relatively small range, this peculiar crow is patchily distributed, but locally quite common. Reaches its N limit c. 20 km N of Palu (thus absent from almost entire Minahassa Peninsula). Occurs in a number of protected areas, including forest reserves and national parks.
Bibliography. Coates & Bishop (1997), Collar *et al.* (2001), Goodwin (1986), Jepson (1997), Madge & Burn (1994), Meinertzhagen (1926), Riley (1921), Vaurie (1958a), Wardill *et al.* (1999), Watling (1983), White & Bruce (1986).

86. Banggai Crow

Corvus unicolor

French: Corneille des Banggai **German**: Banggaikrähe **Spanish**: Cuervo de las Banggai

Taxonomy. *Gazzola unicolor* Rothschild and E. J. O. Hartert, 1900, Banggai Islands, Sulawesi.
Forms a species pair with *C. typicus*, which it resembles closely in structure; until recently, both were thought to belong with the "*C. enca* complex", but differ from that in their behaviour and vocalizations. Monotypic.
Distribution. Banggai Is, off E Sulawesi.



Descriptive notes. 40 cm; c. 175 g. A small, short-tailed crow with relatively small bill. Plumage is wholly black, weakly glossed with bluish or greenish, bases of hindneck feathers grey; iris dark, tiny patch of bare skin behind eye (probably invisible in the field); bill and legs black. Sexes similar. Juvenile undescribed. Voice. No information.
Habitat. Remnant hill forest, to 900 m on W side of Peleng; most other islands in archipelago quite low-lying.
Food and Feeding. No published information.
Breeding. No published information.
Movements. Sedentary.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Banggai and Sula Islands EBA. Very rare; very poorly known. Following its initial discovery, in 1880s, remained undetected for more than a century until, in 1991, an individual was found on mountain slopes of Peleng, largest island of the archipelago, suggesting that this species survived on W side of this island. Subsequent searches in 2004, 2006 and 2007 confirmed that this species survived, but only in forest on mountain slopes of W Peleng and, in small numbers, at lower levels in centre of the island. Very rough estimates suggest global population of between 30 and 200 individuals. Since these observations were made, local conservationists have worked in conjunction with local communities to devise ways in which the crow and its forest habitat can be protected. Help is being provided to enable communities to practise more sustainable agriculture; development of ecotourism may also help in increasing local awareness of the archipelago's important biodiversity. Establishment of forest reserves on these islands is a matter that requires urgent attention.
Bibliography. Anon. (2008p), Bishop (1992a), Butchart & Stattersfield (2004), Coates & Bishop (1997), Collar *et al.* (2001), Goodwin (1986), Indrawan & Masala (2007), Indrawan *et al.* (1997), Madge & Burn (1994), Masala *et al.* (2008), Meinertzhagen (1926), Riley (1921), Stattersfield & Capper (2000), Vaurie (1958a), White & Bruce (1986).

87. Flores Crow

Corvus florensis

French: Corneille de Florès **German**: Floreskrähe **Spanish**: Cuervo de Flores

Taxonomy. *Corvus florensis* Büttikofer, 1894, Maumere, Flores, Lesser Sundas.
Sometimes placed in a separate genus, *Nesocorax*. Relationships uncertain; perhaps an ancient derivative of the "*C. enca* complex", but differs fundamentally in bill structure and plumage texture. Possibly nearest to *C. typicus* and *C. unicolor*. Monotypic.
Distribution. Flores, in Lesser Sundas.
Descriptive notes. 40 cm; c. 175 g. Small crow with relatively short bill with gently curving culmen, nostrils very long but concealed by dense nasal tuft (which extends half-way along side of upper mandible and overlaps base of culmen), relatively long tail and broad, rounded wings; plumage soft in texture. Plumage is purplish-black, not highly glossed, bases of neck feathers smoky grey; iris dark brown, tiny patch of bare skin behind eye; bill and legs black. Sexes similar. Juvenile apparently similar to adult, but information inadequate. Voice. Usual call a high-pitched, but downwardly inflected rasping "cwaaa" or "waaaak", repeated up to three times, delivered with downward tail-pumping or with head thrown back with each call. Sometimes gives elaborate resonant pumping and gurgling, which becomes progressively louder with repetition. Hoarse wheezing contact call also reported, as well as a drawn-out call likened to that of a wailing human baby.
Habitat. Tall secondary and primary moist, semi-deciduous monsoon forest along watercourses; chiefly in lowlands, but occasionally in hills, to 950 m. Has been found in relict patches of tall



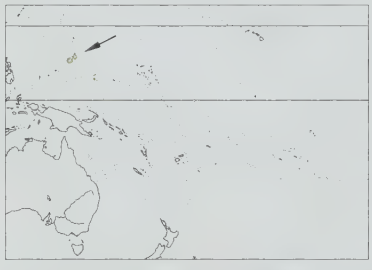
forest in areas of short secondary growth, but such fragmentation probably unsuitable for long-term survival. Possibly also in forest habitats remaining in E Flores, which markedly drier.
Food and Feeding. No specific information on diet; most likely to consist of small invertebrates and small fruits. Forages in ones and twos, parties of up to five being family groups. Larger gatherings very rare, but 15 reported together in 1988. Feeds in tree canopy, both in crown and in subcanopy. Like *C. typicus*, its flight is rapid and direct with shallow whistling wingbeats.
Breeding. Season Sept–Jan. Nest constructed of sticks, built c. 12 m above ground; one documented nest was in isolated tree amid wooded cultivation but close to edge of forest. Clutch 2–3 eggs, usually 3. Nest sometimes parasitized by Channel-billed Cuckoo (*Scythrops novaehollandiae*) and possibly by Common Koel (*Eudynamys scolopacea*). No other information.
Movements. Sedentary.
Status and Conservation. ENDANGERED. Restricted-range species: present in Northern Nusa Tenggara EBA. Rare. Formerly found throughout Flores, but now virtually restricted to rainforests at extreme W end of the island, where occurs in four prime areas: Wolo Tadho Nature Reserve, Mbeliling, Sano Nggoang and Nggorang Bowosie (at E limit of regular recent sightings on N coast, with Kisol at E limit on S coast). Has been reported also from Wae Wuul Nature Reserve, near Mbura. It is important that further forest reserves are allocated or extended, and protection implemented. Until at least 1998 was present much farther E on N coast, at Mausambi, and could well exist as small pockets elsewhere in E and in interior and C parts of the island. A forest inhabitant, and has always had reputation for being rare and poorly known. Seems to be intolerant of forest clearance, and at most of its "regular" sites the impression is that it is definitely decreasing, presumably through forest fragmentation. Forest clearance has also allowed considerable range expansion of larger *C. macrorhynchos* on Flores, which could result in potential nest predation by latter. Present species reported as having reputation in some villages for stealing chicken eggs, and some villagers regard it as a pest and put out eggs laced with DDT to poison the crows. Rate of forest destruction on Flores is alarming; clearly, the only way to save this corvid is by creating large forest reserves and strictly enforcing logging controls, as well as through programmes aimed at increasing public awareness of the island's unique wildlife.
Bibliography. Anon. (2008p), Butchart & Stattersfield (2004), Butchart *et al.* (1994, 1996), Coates & Bishop (1997), Collar *et al.* (2001), Drijvers *et al.* (2000), Gibbs (1990), Goodwin (1986), Jepson (1997), Madge & Burn (1994), Meinertzhagen (1926), Pilgrim *et al.* (1997), Rensch (1931), Smith (1983), Stattersfield & Capper (2000), Vaurie (1958a), Verhoeye & Holmes (1999), White & Bruce (1986).

88. Mariana Crow

Corvus kubaryi

French: Corneille de Guam **German**: Guamkrähe **Spanish**: Cuervo de las Marianas
Other common names: Guam/Kubary's Crow

Taxonomy. *Corvus Kubaryi* Reichenow, 1885, Palau; error = Guam.
Relationships uncertain; appears to be derived from *C. splendens* of S Asia. Monotypic.
Distribution. Rota and Guam, in S Northern Marianas.



Descriptive notes. 38 cm; male 231–270 g, female 205–260 g. A small crow with lax plumage. Plumage is coal-black, with greenish-black gloss on head and back, bluish-black tail, and dull underparts; base of feathers grey, grading to white around neck (giving ragged appearance); iris brown; bill and legs black. Sexes similar, male slightly larger than female. Immature resemble adult, except for having less gloss and browner wings and tail. Voice. Poorly known. Adult gives high-pitched "caw" or "hi", often in series, as contact or locational call; sometimes more nasal and drawn out, as "caaaw" or "aaa". Juvenile location call similar, but shorter than those given by adults. Alarm call sharp series of rapid "caws". Adults and young give soft, rambling monologues when together at a nest, alone, or near other birds. Juvenile beg with squalling "aaa", rising in inflection.
Habitat. Most commonly in mature native limestone forest characterized by fig (*Ficus*) and yoga (*Elaeocarpus*) trees. Also habitats other than mature native forest, including secondary limestone forest, coastline forest, ravine forests, agricultural forests, and coconut (*Cocos nucifera*) plantations. Possible that immatures prefer secondary limestone forests for foraging. Croplands, savannas, grasslands and urban areas rarely used today; in the past, when the species was abundant, frequently foraged on croplands and was viewed by some as an agricultural pest.
Food and Feeding. Omnivorous, eating a varied mix of invertebrates, small vertebrates and plant matter. Invertebrates include Lepidopteran larvae, grasshoppers and mole-crickets (Orthoptera), praying mantis (Mantidae), earwigs (Dermaptera), hermit crabs (Paguroidea); small vertebrates skinks (Scincidae), geckos (Gekkonidae), immature rats (*Rattus*), bird eggs; vegetable matter includes foliage, fruits, seeds and buds of 26 species of native and introduced plant species on Rota, 18 species on Guam. Forages throughout all layers of forest, from canopy to ground. In detailed studies on Rota, most foraging at 4·9 m above ground (canopy 7·5 m tall). Usually found in pairs or extended family groups of 3–5 individuals, occasionally in flocks of up to 15; in recent past on Guam, communal roosts of 25–66 birds.
Breeding. Primarily during dry season, Aug–Feb, but may breed throughout year, nest-building from as early as end Jul and fledging as late as May on Rota; in recent times, season on Guam shortened, Oct to mid-Apr, perhaps in response to nest predation by snakes; renest within 2 weeks of failure, most pairs nesting two or more times per year (up to seven repeat attempts documented) because of initial failures. Territorial throughout year; on Rota, each pair defends 12–37 ha of forest. Nest built by both sexes, working together for c. 7 days, a bulky structure 24–53 cm in diameter, 15 cm thick, consisting of banago (*Jasminum marianum*) twig platform, intermediate cup of interwoven *Ficus* twigs, rootlets, vines and coconut palm fibres, and finely lined inner cup (often of *Flagellaria* tree fibres on Guam), placed in variety of native trees, often at 4–10 m, on Guam usually in outer portion of canopy of emergent tree, on Rota in inner portion of canopy of

non-emergent tree; difference in nest placement may reflect attempts to avoid snakes on Guam and drongos (*Dicrurus*) on Rota. Clutch 1–4 eggs (average 2·3); incubation, typically by female, period 21–23 days; chicks fed by both parents, nestling period 36–39 days; fledglings are poor fliers, tended by parents for 99–537 days, stay with parents in natal territory until following breeding season (prolonged parental care means that some paired adult crows may not breed every year). Examined nests usually only contain a single young bird; only about 50% of these reach fledging. Regular nest failure, historically caused by severe typhoons, appears to have selected for rapid and repeated nesting attempts.
Movements. Resident.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Mariana Islands EBA. Rare and declining. Global population in 2009 estimated at fewer than 250 individuals, with just 4 on Guam (reintroduced from Rota); this is only 50% of estimate made in 2006. Best estimates of population trend on Rota suggest decline of 69–94% from 1982 to 2004. Has never been abundant nor widely distributed, but recent extirpation from Guam and reduction in population size on Rota make its current status extremely tenuous. Extinction on Guam directly attributable to arrival of exotic species, most importantly brown tree-snake (*Boiga irregularis*); during 1940s crows abundant throughout forests of Guam, but numbers dropped precipitously after brown tree-snakes were accidentally introduced to the island at end of world war; by 1978 crows restricted to the northern third of the island; last native crow on Guam died in 2003; 10 birds translocated from Rota to Guam by 2006, but by 2009 only 4 remained. Listed on US Endangered Species Act as "endangered" since 1984, and protected by Guam law since 1981. Important habitat for the crow on Guam is protected by a National Wildlife Refuge and designation of critical habitat (as allowed by Endangered Species Act); critical habitat designated also on Rota. A US recovery plan and federally appointed recovery team work with local and national landowners, managers and residents to guide the recovery of the species. Intensive management, including snake removal, protection of nest trees from predators, captive-breeding and propagation of young, reintroduction and translocation of eggs, young and adults between islands are currently being used to maintain the species on Guam. Predation by accidentally introduced brown tree-snakes clearly the most important limiting factor on Guam; reasons for declines on Rota are poorly understood, but limiting factors may include human persecution, predation by rats, monitor lizards (*Varanus*) and cats, loss and degradation of limestone-forest habitat by human activity and invasion of exotic plants and animals, harassment by and competition with introduced Black Drongos (*Dicrurus macrocercus*), lingering effects of previously widely used pesticides, disruption of social behaviour owing to small population size, and reduced nesting success from increasingly common and violent typhoons. Crows on Rota are significantly less genetically diverse than those on Guam and contain no novel genetic sequences; this suggests those on Rota were derived from those on Guam, and that either a recent and small founding population colonized Rota or the original Rota population was greatly reduced in size in recent past; either event could have occurred as recently as late 1940s, when Rota was denuded by battles of world war. As with most long-lived birds, high adult survival (for this species in excess of 90%) is a key to population viability. It is estimated that recovery to a level where three self-sustaining populations each of at least 75 territorial pairs exist on Rota, N Guam and S Guam would cost in excess of US$600 million and take at least 50 years. To meet this recovery goal and prevent extinction of this corvid, federal, state and private stakeholders are attempting to reduce the population of brown tree-snakes on Guam, reduce threat of the snake colonizing Rota, protect and restore limestone forest on Guam and Rota, and determine what is currently limiting the crow on Rota. The trust and co-operation of the people of Rota and Guam is essential to these efforts.
Bibliography. Anon. (1997, 2006, 2008p), Baker (1951), Butchart & Stattersfield (2004), Duckworth *et al.* (1997), Engbring & Pratt (1985), Fancy *et al.* (1999), Jenkins (1983), Lusk & Taisacan (1996), Meinertzhagen (1926), Morton *et al.* (1999), Plentovich *et al.* (2005), Savidge (1987), Stattersfield & Capper (2000), Steadman (1999), Steinheimer (2009), Tarr & Fleischer (1999), Tomback (1986), Wiles (1998), Wiles *et al.* (2003).

89. Long-billed Crow

Corvus validus

French: Corneille des Moluques **German**: Molukkenkrähe **Spanish**: Cuervo Moluqueño
Other common names: Moluccan Crow

Taxonomy. *Corvus validus* Bonaparte, 1850, Halmahera.
Affinities uncertain; has been considered to be part of the "*C. enca* complex", but its pale eyes suggest an affinity with Australian group of crows. Monotypic.
Distribution. Morotai, Halmahera, Kayoa, Kasiruta, Bacan and Obi, in N Moluccas.



Descriptive notes. 46–53 cm; c. 300 g. Large crow with top-heavy appearance created by very long bill and relatively short tail; bill gradually tapering from relatively deep base, culmen gently curving over distal third, prominent nasal tuft but (because of bill length) bristles hardly conceal base of culmen; tail relatively short and almost square at tip. Plumage is black, with purple gloss on upperparts, including wing, head glossed steel-blue, becoming green on throat; bases of neck feathers pure white; underparts dull black, very fine grey fringes on feathers of lower underparts; iris bluish-white; bill and legs black. Sexes similar. Juvenile has dark iris and duller, unglossed plumage. VOICE. Call an abrupt, dry, croak, "cruk…cruk…cruk", has been likened to bark of a puppy.
Habitat. Favours primary forest, in both lowlands and hills, and found more locally also in secondary or partially logged forest. Frequently recorded in farmland, including coconut (*Cocos nucifera*) plantations, and *Imperata* grassland with stands of trees. Sea-level to 380 m on Halmahera, and to 1150 m on Bacan.
Food and Feeding. No information on diet; from amount of time spent in tree canopy, likely to include various fruits and berries. Keeps within tree canopy for as long as possible; spends little time on ground or anywhere in open. Often perches on top of tall forest tree and calls for several minutes. Generally encountered singly or in pairs; also in small parties, presumed to be family groups.
Breeding. No information.
Movements. Sedentary.
Status and Conservation. Not globally threatened. Restricted-range species: present in Northern Maluku EBA. Poorly documented; seems to be reasonably numerous. Perhaps lives at low density over the most heavily forested parts of the island.

Bibliography. Bishop (1992a), Butchart *et al.* (1994), Coates & Bishop (1997), Collar *et al.* (2001), Gibbs (1990), Goodwin (1986), Jepson (1997), Madge & Burn (1994), Riley (1921), Smith (1983), Vaurie (1958a), Watling (1983), White & Bruce (1986).

90. White-billed Crow

Corvus woodfordi

French: Corneille à bec blanc **German**: Buntschnabelkrähe **Spanish**: Cuervo Piquiblanco
Other common names: Solomon(s) Crow

Taxonomy. *Macrocorax woodfordi* Ogilvie-Grant, 1887, Aola, Guadalcanal, Solomon Islands.
Probably closest to *C. meeki*, *C. fuscicapillus* and *C. tristis*, all apparently forming part of an "old endemic" Melanesian group. May form a superspecies with *C. meeki*; sometimes treated as conspecific, but differs in bill and eye colours, nature of nasal bristles, and plumage gloss. Proposed race *vegetus* (described from S Santa Isabel) considered inadequately differentiated from those in rest of species' range. Monotypic.
Distribution. Choiseul, Santa Isabel and Guadalcanal Is, in Solomon Is.



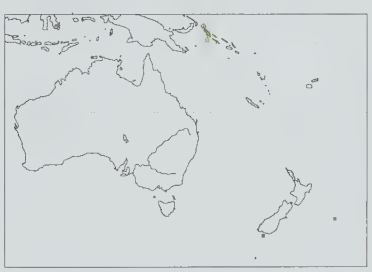
Descriptive notes. 40–41 cm; male 615 g, female 555–568 g, unsexed 375–568 g. Medium-sized, short-tailed crow with massive dark-tipped pale bill, culmen strongly arched; nasal bristles parted at forehead; feathers of head and neck fine and silky. Plumage is entirely black, somewhat glossed green (those on Choiseul slightly glossier); iris brown or grey to dull bluish-white; bill ivory-coloured with black tip (often appears pale pink in life); bare purplish-red inter-ramal skin on side of chin; legs black, soles orange. Sexes similar, male larger than female (especially on Choiseul and Santa Isabel). Juvenile undescribed. VOICE. Series of staccato cawing notes, higher-pitched and more rapid than those of *C. orru*.
Habitat. Lowland and montane rainforest to 1000 m, rarely to 1250 m; more common in hills. Frequents forest interior and forest edge, and may forage in nearby coconut (*Cocos nucifera*) plantations.
Food and Feeding. Omnivorous. Food insects, mainly beetles (Coleoptera), also fruits. Forages singly, in pairs and in small groups in forest canopy. Gleans unobtrusively in foliage.
Breeding. Three of four adult females were approaching breeding condition in Jun–Jul, suggesting laying in austral spring. No further information available.
Movements. Resident, with no records outside normal distribution. Flocks are apparently mobile locally.
Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Locally common within small global distribution, where seen in small flocks. Biology very poorly known.
Bibliography. Doughty *et al.* (1999), Dutson (2009), Goodwin (1986), Kratter, Steadman, Smith & Filardi (2001), Kratter, Steadman, Smith, Filardi & Webb (2001), Madge & Burn (1994), Mayr (1945b), Meinertzhagen (1926), Webb (1992).

91. Bougainville Crow

Corvus meeki

French: Corneille de Meek **German**: Bougainvillekrähe **Spanish**: Cuervo de la Bougainville
Other common names: Short-tailed/Solomon (Islands) Crow

Taxonomy. *Corvus meeki* Rothschild, 1904, Bougainville Island, Solomon Islands.
Probably closest to *C. woodfordi*, *C. fuscicapillus* and *C. tristis*, all apparently forming part of an "old endemic" Melanesian group. May form a superspecies with *C. woodfordi*; sometimes treated as conspecific, but differs in bill and eye colours, nature of nasal bristles, and plumage gloss. Sometimes treated as conspecific with *C. insularis*, but differs notably in iris colour of adult, vocalizations, preferred habitat, lack of flocking behaviour, and flight action (shallow wingbeats, as opposed to deep wingbeats interspersed with glides). Monotypic.
Distribution. Buka I, Bougainville I and Shortland Is, in extreme N Solomons.



Descriptive notes. 40–41 cm. Medium-sized, glossy crow with massive bill with strongly arched culmen, and short narrow tail; nasal bristles forming tuft at base of culmen (not parted at forehead). Plumage is entirely black, with strong bluish-green gloss on head and underbody and strong purple gloss on upperparts; iris mid-brown to dark brown; bill black; bare purplish-red inter-ramal skin on side of chin; legs black, soles orange. Sexes similar. Juvenile is similar to adult; young have pale blue-grey to mid-brown eyes, the former perhaps juveniles, the latter probably subadults. VOICE. Series of raucous or staccato cawing notes, similar to calls of *C. woodfordi*; higher-pitched and more rapid than those of *C. orru*, but slower and more rolling than call of *C. insularis*.
Habitat. Principally rainforest; also occurs at forest edge, and in open country, village gardens, and occasionally coconut (*Cocos nucifera*) plantations; lowlands to at least 1600 m.
Food and Feeding. Eats insects, berries and fruits, including papaya (*Carica papaya*) in gardens. Forages in small groups, sometimes noisily, in forest canopy. Gleans in foliage.
Breeding. Female specimen from N Solomon Is in breeding condition in Sept, suggesting laying in austral spring. One nest in Mar contained four partly feathered nestlings, and another had a sitting adult. No further information available.
Movements. Resident, with no records outside normal distribution. Flocks are apparently mobile locally.
Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Fairly common to common within very small global range, where often seen in small flocks. Has been listed as Near-threatened, but recent observations suggest that such treatment is unwarranted. Biology very poorly known.

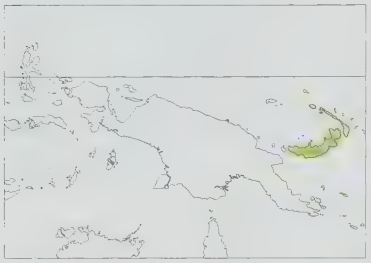
Bibliography. Coates (1990), Coates & Peckover (2001), Doughty *et al.* (1999), Dutson (2009), Dutson *et al.* (2009), Goodwin (1986), Hadden (1981, 2004), Jones & Lambley (1987), Madge & Burn (1994), Mayr & Diamond (2001), Meinertzhagen (1926), Schodde (1977).

92. Bismarck Crow

Corvus insularis

French: Corneille des Bismarck **German**: Heinrothkrähe **Spanish**: Cuervo de las Bismarck
Other common names: Island Crow

Taxonomy. *Corvus insularis* Heinroth, 1903, Gazelle Peninsula, New Britain, Bismarck Archipelago.
Formerly treated as a race of *C. orru*, more recently as a race of *C. meeki*; resembles each in different aspects, but appears sufficiently distinct not to be considered conspecific with either, and probably best treated as a separate species; differs from *C. orru* mainly in overall morphology (structure, bill size, tail length), iris colour of juvenile, and vocalizations; differs from *C. meeki* less markedly in overall morphology, but significantly in iris colour of adult, vocalizations, preferred habitat, flocking behaviour, and flight action (deep wingbeats interspersed with glides, as opposed to shallow wingbeats). Monotypic.
Distribution. Bismarck Archipelago, on New Britain, New Ireland, New Hanover and satellite islands.



Descriptive notes. 40–41 cm. Medium-sized crow with a massive black bill and a rather short tail. Entire plumage is glossy black; iris pale blue; bill black, sometimes with pale tip; legs black. Sexes similar. Differs from *C. meeki* in slightly smaller bill, and slightly longer tail, but most importantly in iris colour. Juvenile is like adult, including pale blue eyes. Voice. Series of short nasal staccato cawing notes, shorter and more rapid than those of *C. orru*, and shorter and less rolling than those of *C. meeki*; caws can end with drawn-out terminal note. Also a long rattling caw and deep knocking sounds.
Habitat. Forest edge, partly cleared areas, gardens, and plantations of coconut (*Cocos nucifera*) and oil palm (*Elaeis guineensis*); lowlands to 1500 m. Sometimes seen in towns; only rarely in closed-canopy forest, the preferred habitat of *C. meeki*.
Food and Feeding. Probably omnivorous; insects, berries and fruits, including wood-boring grubs in coconut plantations. A tame bird was seen to cache surplus food. Forages in small groups both in canopy and on ground; also in gardens.
Breeding. Eggs reported in Feb–Mar and nestling(s) in Mar. One nest was 50 cm wide and 15 cm deep, lined with coconut palm sheath fibres and aerial roots, and built high in fork of tree. No further information available.
Movements. Apparently resident. Flocks appear to be locally mobile; often seen flying at great height, suggesting extensive local movement.
Status and Conservation. Not assessed. Probably not globally threatened. Restricted-range species: present in New Britain and New Ireland EBA. Common in disturbed areas; one of the very few bird species to inhabit oil palm plantations in Bismarcks. Biology very poorly known.
Bibliography. Coates & Peckover (2001), Dutson (2009), Dutson *et al.* (2009), Finch & McKean (1987), Goodwin (1986), Madge & Burn (1994), Mayr & Diamond (2001), Meinertzhagen (1926), Smith (1991), Storer & Eastwood (1991).

93. Brown-headed Crow

Corvus fuscicapillus

French: Corneille à tête brune **German**: Braunkopfkrähe **Spanish**: Cuervo Cabecipardo
Other common names: Brown-capped Crow

Taxonomy. *Corvus fuscicapillus* G. R. Gray, 1859, Dorey, New Guinea; error = Aru Islands, New Guinea.
Probably closest to *C. woodfordi*, *C. meeki* and *C. tristis*, all apparently forming part of an "old endemic" Melanesian group. Races based on small sample sizes, and validity doubtful; racial affinity of birds on New Guinea mainland not certain. Two subspecies tentatively recognized.
Subspecies and Distribution.
C. f. megarhynchus Bernstein, 1864 – W Papuan Is (Gemien and Waigeo).
C. f. fuscicapillus G. R. Gray, 1859 – Aru Is.
Also, of uncertain race, in coastal NW New Guinea.
Descriptive notes. 45 cm. Medium-sized crow with massive, strongly arched bill, and short tail squared at end; nasal bristles parted at forehead; throat feathers bristly, and breast feathers hair-like, loose and scruffy. Male has glossy black plumage, except for dark brown head and neck, and abdomen with distinct brown tones; iris blue; bill and legs black. Female is like male, but has black-tipped yellow bill, sometimes some black also at bill base (uncertain whether bill colour of female related to age or breeding status). Juvenile is scruffier and browner than adult, with yellow bill. Races differ slightly in size, although few specimens: *megarhynchus* is apparently larger, and larger-billed, than nominate. Voice. Deep, harsh cawing notes, either staccato and disyllabic (or perhaps antiphonal) or drawn out; deeper than those of *C. orru*.



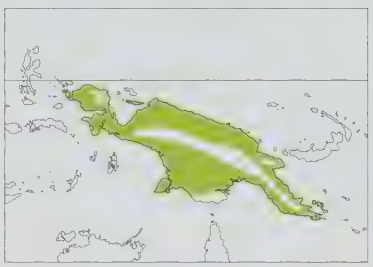
Habitat. Lowlands and foothills, in rainforest and mangroves. Usually deep in primary forest, occasionally in secondary growth; rarely in open areas, and avoids shoreline and outlying islands.
Food and Feeding. Feeds on fruits. Forages singly, in pairs and occasionally in small flocks in forest canopy. Gleans in foliage.
Breeding. No information.
Movements. No information, but probably sedentary.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Aru Islands EBA, Northern Papuan lowlands EBA and West Papuan lowlands EBA. Generally rare, and biology very poorly known. Most numerous in wetter parts of range. Locally well distributed in Aru Is in low numbers, and locally common in parts of NW New Guinea mainland. Has fragmented and restricted distribution, where usually seen singly or in pairs, although occasionally in small flocks. Some areas of habitat threatened by logging, by mining and by damming of rivers, although large areas of intact forest, including protected areas, remain.
Bibliography. Anon. (2008p), Beehler *et al.* (1986), Butchart & Stattersfield (2004), Coates (1990), Coates & Peckover (2001), Diamond & Bishop (1994), Eastwood (1996), Goodwin (1986), Iredale (1956), Madge & Burn (1994), Meinertzhagen (1926), Rand & Gilliard (1967), Stattersfield & Capper (2000).

94. Grey Crow

Corvus tristis

French: Corneille grise **German**: Greisenkrähe **Spanish**: Cuervo Gris
Other common names: Bare-eyed/Bare-faced Crow

Taxonomy. *Corvus tristis* Lesson and Garnot, 1827, Dorey Harbour, New Guinea.
Probably closest to *C. woodfordi*, *C. meeki* and *C. fuscicapillus*, all apparently forming part of an "old endemic" Melanesian group. Monotypic.
Distribution. New Guinea, except lowlands of Trans-Fly; also West Papuan Is (Salawati, Batanta), Yapen I (in Geelvink Bay) and D'Entrecasteaux Archipelago.



Descriptive notes. 51–56 cm; one bird 635 g. Medium-sized, long-tailed, scruffy crow with stout bill and bare pink facial skin; sparse nasal and rictal bristles. Plumage is variable, blackish to dark brown or grey, with slightly glossy wings and tail; iris light blue; bill grey; legs pink to grey. Sexes similar. Juvenile much paler than adult, pale grey-brown above, whitish on head and below, appearing rather bleached, with brown eyes and white bill; immature is only marginally less pale, with pink bill and feet (birds with mottled grey-brown eyes are probably immature); takes three years to acquire darker adult plumage. Voice. Series of plaintive, startled, rising caws, resembling yelping when several birds in chorus. Also utters hoarse, weak caw, whining caw, and bursts of excited hoarse caws.
Habitat. Primary rainforest, forest edge, secondary growth, gardens, swamp-forest; lowlands to 1500 m. Sometimes visits open areas and riverbanks or sandbars.
Food and Feeding. Feeds mainly on fruits in forest canopy; also takes insects, especially when raising young, and sometimes scavenges. Forages often in noisy groups. Gleans in foliage and also on ground.
Breeding. Poorly known. Apparently breeds through dry season (austral autumn–spring); two nests found in Mar, nestlings in Oct to early Dec, and fledglings in Oct–Nov (including group of five fledglings and five adults in Oct). One nest was a bowl of sticks in outer fork near top of emergent deciduous tree over rainforest, contained four fully grown nestlings, attended apparently by only two adults; one nests in top of tree in primary forest and another high in large forest-edge tree. No information on clutch size; one alleged clutch of 2 eggs not attributable to this species. No other information.
Movements. Resident; flocks apparently locally mobile.
Status and Conservation. Not globally threatened. Locally fairly common to common, and widespread. Often observed in flocks of up to ten individuals, rarely up to 50.
Bibliography. Beehler *et al.* (1986), Coates (1990), Coates & Peckover (2001), Diamond (1972), Glynn (1995), Goodwin (1986), Jollie (1978b), Madge & Burn (1994), Meinertzhagen (1926), Peckover & Filewood (1976), Rand & Gilliard (1967), Schodde & Hitchcock (1968), Walters (2005).

PLATE 37 ➤



PLATE 37

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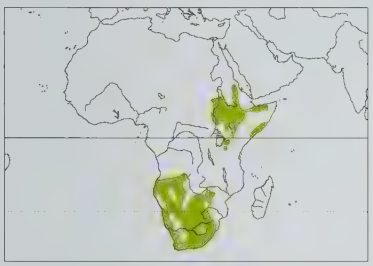
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95. Cape Crow

Corvus capensis

French: Corneille du Cap **German**: Kapkrähe **Spanish**: Cuervo de El Cabo
Other common names: Cape/African Rook, Black/African Crow

Taxonomy. *Corvus capensis* M. H. C. Lichtenstein, 1823, Cape of Good Hope, South Africa.
Has been suggested that this species could form a superspecies with *C. frugilegus*, but there are major differences between the two, not least in nesting habits, the most apparent similarity between them being the pointed bill. Races, although geographically disjunct, are not well marked. Two subspecies recognized.
Subspecies and Distribution.
C. c. kordofanensis Laubmann, 1919 – SE Sudan, N Eritrea, most of Ethiopian Highlands, N & SE Somalia, SE Uganda, W & C Kenya and extreme N Tanzania.
C. c. capensis M. H. C. Lichtenstein, 1823 – from C Angola, W Zambia and Zimbabwe S to South Africa, Swaziland and Lesotho; possibly also SW Mozambique.



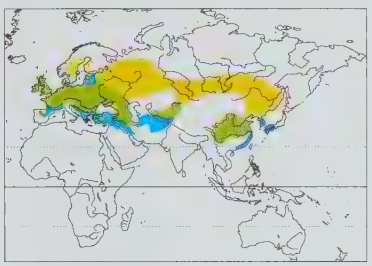
Descriptive notes. 48–50 cm; 410–697 g. Large crow with distinctive head-and-bill shape (rather flat forecrown, slim pointed bill with gently decurved culmen, and prominent throat hackles); moderate-length tail with only slightly rounded tip. Plumage is entirely black, glossed with violet and green on upperparts, upperwing and tail, less intensely glossed with bronze on head and neck, with dull black underparts and underwing; with wear, plumage becomes less glossy, at times even quite brownish; iris dark brown; bill and legs black. Sexes alike. Juvenile is similar to adult, but plumage softer and dull sooty brown, although in fresh plumage some gloss on secondaries and tail feathers. Distinguished easily from *C. edithae* by slender bill and rather flat crown, as well as more squared tail tip. Races differ in size: *kordofanensis* is smaller than nominate, mean male wing length 321 mm (nominate mean 347 mm). Voice. Harsh cawing "kraa-kraa-kraa" uttered at variety of pitches and speeds, from short, rising, rasped "kraa" to longer rising "krooaah", a series of calls perhaps terminating with downslurred "krooaaauw". Often calls from roadside pole, bowing with erected throat hackles, giving gurgling "gwurrr" followed by sharp "tik". Also produces a variety of gurgling and bubbling sounds both in display flight and when perched, these rendered variously as "kwollop, kwollop..." or "glogloglog...".
Habitat. Occurs in open country with scattered trees, from moorland and alpine meadows, through farmland and acacia (*Acacia*) savanna to stands of riverine trees in semi-desert conditions; prime habitat seems to be upland farmland with scattered trees; in W Kenya mostly between 1200 m and 2500 m, and above 1800 in Ethiopia, whereas in coastal Somalia has been found almost at sea-level. S populations can be found locally at sea-level (in SW & NE South Africa), but tend to occur mostly farther inland. In Zimbabwe, species restricted to C plateau above 900 m, occurring up to 2200 m.
Food and Feeding. Omnivorous. Various roots, seeds and grain, including maize and peanuts, small bulbs (e.g. *Cyperus*), fruits and berries (*Scutia*, *Royena* and *Opuntia*). Major component of diet invertebrates, particularly insects such as beetles (Coleoptera), grasshoppers and locusts (Orthoptera) and termites (Isoptera), including their larvae and pupae; also centipedes (Chilopoda), millipedes (Diplopoda) and worms (Annelida). Also small vertebrates, i.e. frogs, lizards, rodents and bird eggs and nestlings. Said rarely to kill newborn lambs or sickly sheep, and may sometimes feed on carrion, including dried flesh from dead fur seals (*Arctocephalus*). Forages on ground, alone or in pairs, walking with long strides, sometimes hopping; parties and small flocks develop, occasionally containing as many as 200 or even 1000 individuals, these likely unmated non-breeding birds. Digs vigorously in soil with bold backward-stabbing action or gentler probing; turns over animal droppings, and sometimes alights on back of grazing animal to search for ectoparasites. Also reported instance of an individual hovering over clutch of Ostrich (*Struthio camelus*) eggs and dropping stones to break them. Food-hoarding observed; buries food scraps in sand, returning later to retrieve them. Despite its varied diet, and unlike many other crows, seems to shun rubbish dumps and towns, although readily follows ploughing tractors. Flies with deep, measured beats, appearing less agile than *C. albus*, and rarely soars. Non-breeders form roosts of 30–50 birds, exceptionally as many as 600.
Breeding. Laying season varies with onset of local rains, breeding reported Dec–Feb in Sudan, Feb–May in Eritrea and Ethiopia, Mar–Apr and Dec in Kenya, and Mar–Dec in Somalia; in S of range laying chiefly Aug–Dec, a little later (Sept–Jan) in Botswana; sometimes double-brooded. Monogamous, probably with lifelong pair-bond. Solitary nester. Nest probably wholly built by female, an untidy mass of sticks, cup lined with wool, feathers, fur and dried dung, placed 2–24 m above ground in tree fork, in tall thicket, on telegraph pole, in artesian windmill and similar, rarely on cliff ledge; nest repaired each year for reuse; territory c. 60 ha. Clutch 1–6 eggs, mostly 4; incubation by both sexes, period 18–19 days; chicks fed by both parents, nestling period 36–39 days; young remain with parents for first 6 months. Nests occasionally parasitized by Great Spotted Cuckoo (*Clamator glandarius*).
Movements. Sedentary. A few records outside normal range (N Angola, S DRCongo and S Zambia) indicate propensity to wander; in South Africa, stragglers reported in C & W Free State well away from breeding areas in E.
Status and Conservation. Not globally threatened. Common and widespread, but somewhat localized, over extensive range. No population estimates made, but density in optimum habitat 1 pair/5 km². Accused of killing newborn lambs in parts of South Africa, where consequently deemed a local nuisance, especially in Great Karoo, where c. 50% of farmers "control" this corvid's numbers by shooting, poisoning and nest destruction.
Bibliography. Allan (1981), Ash & Atkins (2009), Britton (1980), Cyrus & Robson (1980), Fry *et al.* (2000), Goodwin (1986), Hall & Moreau (1970), Harrison *et al.* (1997), Hockey *et al.* (2005), Irwin (1981), Mackworth-Praed & Grant (1960), Maclean (1993), Madge & Burn (1994), Meinertzhagen (1926), Morgan-Davies (1967), Newman (1990), Skead (1952), Steyn (1965), Urban & Brown (1971), Wilson (1990, 1993), Winterbottom (1975), Zimmerman *et al.* (1996, 1999).

96. Rook

Corvus frugilegus

French: Corbeau freux **German**: Saatkrähe **Spanish**: Graja
Other common names: Eurasian Rook; Eastern Rook (*pastinator*)

Taxonomy. *Corvus frugilegus* Linnaeus, 1758, Europe = Sweden.
Has been suggested that this species could form a superspecies with *C. capensis*, but there are major differences between the two, not least in nesting habits, the most apparent similarity between them being the pointed bill. Races possibly merit treatment as separate species; although breeding ranges not known to meet (200 km apart at nearest points), intermediates are said to occur in foothills of Altai and Sayan Mts; further research required. Proposed races *tschuii* (described from Gilgit, in N Pakistan) and *ultimus* (from Russian Altai) are on average smaller and finer-billed than other taxa, but differences considered trivial and both are synonymized with nominate; populations of E Siberia, Mongolia and NE China described as race *centralis*, tending to be slightly larger and with a more purplish sheen than *pastinator*, but differences considered clinal and insufficient to warrant naming of additional race. Two subspecies currently recognized.
Subspecies and Distribution.
C. f. frugilegus Linnaeus, 1758 – breeds from S Sweden, S Norway and W Finland, British Is, France and N Spain (isolated population in Leon) E across Europe (N of Alps) and W Siberia (N to 60° N) to R Yenisei and NW foothills of Altai and, in S, to Asia Minor, Armenia, Azerbaijan and NW Iran, patchily N through Caucasus region (avoiding mountains) to S Russia, and from S Kazakhstan, Uzbekistan and N Turkmenistan E to foothills of Tien Shan in Kyrgyzstan and extreme NW China (NW Xinjiang). N populations migrate S to Mediterranean Basin and Middle East E across Iran to Afghanistan, NW China and NW Indian Subcontinent.
C. f. pastinator Gould, 1845 – breeds from C Siberia and N Mongolia (from upper R Yenisei) E to SE Russia (Amur basin S from Yakutsk) and in C & NE China (E from E Qinghai and E Gansu, S to N Zhejiang). N populations migrate to E China, Korea and Japan.
Introduced (nominate race) in New Zealand, chiefly in S part of North I and Canterbury area of South I.



Descriptive notes. 44–46 cm; 325–571 g. Relatively small-headed, short-legged crow with low-slung belly, loose tibia feathering ("baggy shorts") and tapered pointed bill. Nominate race is wholly black, highly glossed with bluish and purplish (blue gloss tinged violet in S range), gloss most evident on wing; plumage of head and neck particularly dense and silky; distinctive bare whitish area on chin and lores extending to bill base (bare face empasizes peaked crown); iris dark brown; bill dusky towards tip, becoming whiter towards base (making nostrils apparent, enhanced by absence of nasal bristles); legs dark slate-grey. Sexes similar. Juvenile is less highly glossed than adult, with nape and mantle browner, and bill base and face fully feathered (complete with nasal tuft), extremely similar to *C. corone* (best separated by more pointed bill with less curved culmen, shorter and thinner legs, more peaked crown, and more strongly "fingered" primaries with P9 longer than P5, which is not emarginated); bare face and absence of nasal tuft may not be apparent until 10–15 months of age. Race *pastinator* has feathered face and chin, with just bill base bare and whitish, gloss of head and neck is dull reddish-purple (rather than shiny bluish), N populations have bluer gloss on head and neck are on average a little smaller. Voice. Typical call a hoarse, rasping, slightly rising "gaarrkh", uttered at varying pitches, and repeated excitedly at colonies (rookeries); song a mixture of caws interspersed with variety of chuckles, gurgles and clicks, accompanied by head-bowing. Vocabulary varied, but many calls quite inconspicuous and juveniles generally silent.
Habitat. Mixed farmland in fairly flat open country, typically in lowland riverine plains, with stands of tall trees or patches of woodland for nesting and roosting. Needs extensive areas of grassland or arable farmland for foraging. Found also in large city parks; tall trees at edges of towns and villages are ideal for rookeries, which often in churchyards. In Europe mostly below 400 m, but reaches 700 m in Carpathians; in foothills of Altai, in C Asia, breeds at 2000 m, possibly even a little higher.
Food and Feeding. Omnivorous, but less of a carrion-feeder than are many other crows. Main food items include earthworms (Lumbricidae) and grain; wide range of other small invertebrates taken, notably beetles (Coleoptera) and cranefly larvae (Tipulidae), also such vertebrates as small lizards, frogs and small mammals, and eggs and nestlings of small birds. Grain and seeds taken mostly in autumn and winter, when can account for up to 90% of diet. Grain may be salvaged from stubble fields or dug up from freshly sprouting crop, causing crop damage. Highly gregarious, foraging in flocks in open country; freely mixes with *C. monedula*, *C. dauuricus*, *C. corone* and *C. cornix* and starlings (Sturnidae). Feeds by probing and digging, walking and hopping between bouts of digging. Will also feed along lakeshores and seashores; one reported as dropping mussels (*Mytilus*) on to hard surface to break shells. Scavenges about picnic sites, even entering litter bins, but rarely searches for ectoparasites on necks and heads of large mammals. In suburban gardens many now visit birdtables and feeders, where they show great ingenuity by hanging on suspended bones or fat, or pulling string up with bill and clamping it underfoot to get at food. Also chases other birds to force them to drop food item. In autumn stores food items for the winter, placing acorns, walnuts and pine cones in hole and covering it over with grasses; reported also as storing earthworms, but this possibly only for short period. Roosts in stands of large trees, often flying quite high for considerable distances to reach roost, which usually also attended by large numbers of jackdaws; some winter gatherings reach immense size.
Breeding. Egg-laying begins early to mid-Mar in Britain, early Apr in C Europe but not until mid-Apr in Moscow region, and early May in Omsk region (Russia) and Kazakhstan; introduced birds in New Zealand breed during austral spring, laying late Aug to mid-Nov; single-brooded. Despite highly gregarious nature, has long-term, possibly lifelong pair-bond; promiscuity, however, commonplace. Strongly colonial, forming rookeries of a few pairs up to thousands of pairs (up to 2000 in C Europe, up to 50,000 in Kazakhstan) in stands of tall mature trees, up to 60 nests in crown of single very large tree; in open steppe rookeries may be in bushy thickets as low as 4 m from

On following pages: 97. Northwestern Crow (*Corvus caurinus*); 98. American Crow (*Corvus brachyrhynchos*); 99. Tamaulipas Crow (*Corvus imparatus*); 100. Sinaloa Crow (*Corvus sinaloae*); 101. Fish Crow (*Corvus ossifragus*); 102. Palm Crow (*Corvus palmarum*); 103. Jamaican Crow (*Corvus jamaicensis*); 104. Cuban Crow (*Corvus nasicus*); 105. White-necked Crow (*Corvus leucognaphalus*); 106. Carrion Crow (*Corvus corone*); 107. Hooded Crow (*Corvus cornix*); 108. Large-billed Crow (*Corvus macrorhynchos*).

ground; cases of nests constructed on electricity pylons, and even in reedbeds as in Azerbaijan, where rookery of 250 nests constructed from bent-over reed stems and dry leaves seems to thrive; in Volga Delta also in mixed colonies with cormorants (Phalacrocoracidae), herons (Ardeidae) and Glossy Ibises (*Plegadis falcinellus*). Nest built by both sexes, male bringing in material and female undertaking most of construction work, both sexes constructing and shaping the cup, work can take 1–4 weeks (depending on how much material stolen by occupants of neighbouring nests); a bulky structure of twigs and sticks, cup lined with roots, dry grasses and dead leaves; nest may be repaired and reused for many years. Clutch 2–7 eggs, usually 4; incubation by female alone, although male briefly covers eggs while female leaves nest, period 16–18 days; chicks tended and fed by both sexes, male alone feeding for first 10 days, nestling period 30–36 days; young fly strongly at 42–45 days, remain with parents and fed by them for 6 weeks from fledging; most then join non-breeding roving flocks, some of which composed entirely of juveniles. Age of maturity or first breeding 2 years, but sometimes attained at one year. Rookeries provide ideal nest-sites for many other birds in regions where trees sparse; disused nests often taken over by falcons, particularly Red-footed (*Falco vespertinus*) and Amur Falcons (*Falco amurensis*), which may form small colonies scattered within rookery, and both Common Kestrel (*Falco tinunculus*) and Lesser Kestrel (*Falco naumanni*) will use old nests, and Long-eared Owls (*Asio otus*) habitually do so.

Movements. Resident over W & S parts of range; migratory in N & E. Ringing recoveries indicate intricate pattern of wintering areas for migratory populations, most of which forsake breeding grounds during Oct. Many Baltic and Dutch breeders winter in E England, those from E Europe (including Poland and Russia) winter in C Europe, those from W & C Ukraine move to plains from Hungary to N Italy, and S Ukrainian birds winter in Bulgaria, whereas those from SC Ukraine move to W Caspian region; a couple of ringing recoveries indicate that N Caspian breeders winter in Iraq; birds from NW Kazakhstan move to lowlands of SW Caspian, and many other Kazakh birds winter from N Iran to Uzbekistan, being joined by others from Altai region to winter from E Uzbekistan to Tajikistan and W Pakistan (chiefly North West Frontier), a few entering Ladakh and NW India (exceptionally to Haryana). Vagrants reported Iceland, Svalbard, Bear I, Balearic Is, Malta, Lebanon, Jordan, Kuwait, Tunisia, Algeria, and Azores and Madeira. N populations of E Asian race (*pastinator*) winter over E China S to Guangdong, with vagrants recorded Hainan I and Taiwan; also winter visitor to Japan, chiefly to Kyushu and Tsushima, with vagrants recorded on Hokkaido and S to Okinawa, and recently reported on Sakhalin I and extreme S Kuril Is (Kunashir), where flocks of up to 100 reported in winter; in S Korea, thought now to be uncommon winter visitor. In New Zealand, where introduced, disperses widely, with vagrants reported Northland, Wellington, Stewart I and even Chatham Is.

Status and Conservation. Not globally threatened. Nominate race abundant, and also well studied. Colonial nesting makes it an easy bird to census, the most recent figures for Europe (excluding Russia) indicating population of between 5,000,000 and 7,500,000 pairs. Numbers of nesting pairs in each country based on surveys undertaken chiefly in 1980s and 1990s: Ukraine 390,000–500,000, Moldova 60,000–70,000, Romania 150,000–200,000, Bulgaria 10,000–100,000, Hungary 118,000, Slovenia 30–50, Croatia 3500, Czech Republic 3000–4000, Slovakia 10,000–17,000, Belarus 700,000–1,200,000, Poland 300,000–900,000, Lithuania 100,000, Latvia 7000–9000, Estonia 5000–10,000, Finland 1100–1200, Sweden 23,000–25,000, Norway 500–700, Denmark 12,000–140,000, Germany 68,000–70,000, Netherlands 28,000, Luxembourg 1700, Belgium 7000–10,000, Britain 853,000–857,000, Ireland 520,000, France 100,000–300,000, Switzerland 300–500, Austria 450, Spain 1000–1500. Outside Europe figures are sparse, but estimates of 4000–5000 pairs in Azerbaijan and 10,000–50,000 pairs in Turkey. Some winter gatherings reach immense size, e.g. roosts of up to 500,000 individuals recorded in several urban centres in Poland. Although flocks widely regarded as destructive to crops (either by perching on and flattening growing corn or by digging up sprouting cereals and root crops), it can be argued that any harm done by this species is balanced by its usefulness in consuming large quantities of insect pests. Nevertheless, is still persecuted in many countries, by means of shooting and also indirectly through use of pesticides. Throughout the 20th century populations of this corvid have risen and fallen according to changes in farming practices, notably the loss of extensive pasture, and also the application of pesticides and seed-dressings. In Netherlands, for example, population was estimated at 40,000 pairs in 1944, had dropped by 97% to 1100 pairs by early 1970s (this blamed principally on pesticides), but by 1985 had risen again to 28,000 pairs. In Latvia, the 16,000 pairs of early 1970s had dropped to 7000–9000 ten years later through persecution. Farther E, has expanded range and increased numbers enormously in S Russia and parts of Kazakhstan, due to afforestation since 1960s with wind breaks in agricultural parts of steppe zone; preys significantly on eggs and chicks of Critically Endangered Sociable Lapwing (*Vanellus gregarius*). Elsewhere in C Asia, has become much more localized in the steppe regions and foothills of Altai. Race *pastinator* appears to have declined considerably over much of its wide range, probably through use of pesticides. At Beidaihe, in NE China, where very large numbers were noted on migration in 1940s ("cloud-like flocks of 10,000" in Nov 1945) and where it was described as a common breeding species, there was no evidence of breeding and only relatively small numbers passing (peak day count of 392) during observations in 1985–1990, despite popularity of the area as a birdwatching holiday destination. Status in Korea unclear, has declined considerably, thought now to be uncommon winter visitor; in Feb 1998, flock of 16,000 observed while foraging on tidal mudflats in Mangyong-gang Estuary. Nominate race introduced into New Zealand during 1862–1874; c. 30,000 birds present in 1978, of which 25,000 in Hawkes Bay area and 2500 about Canterbury, despite attempts to control numbers (at least 35,000 were poisoned or shot during 1971–1976); well established over SE part of North I and Canterbury area of E coast of South I.

Bibliography. Ali & Ripley (1972, 1987b), Bannerman (1954), Beaman & Madge (1998), Brazil (1991), Brenchley (1986), Busse (1969), Chen Fuguan *et al.* (1998), Coombs (1978), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Ena (1984), Gerber (2002), Goodman & Meininger (1989), Goodwin (1986), Grimmett *et al.* (1998), Haffer (1993g), Hagemeijer & Blair (1997), Heather & Robertson (1997), Kasparek (1989), Konstantinov *et al.* (2009), Madge & Burn (1994), Meinertzhagen (1926), Murton (1971), Rasmussen & Anderton (2005b), Reid (1993), Roselaar (1995), Sage & Whittington (1985), Serebryakhov & Grischenko (1990), Shirihai (1996), Stepanyan (2003), Ushakova (2002), Vaurie (1954, 1959), Williams (1986), Williams *et al.* (1992), Yeates (1934).

97. Northwestern Crow

Corvus caurinus

French: Corneille d'Alaska **German**: Sundkrähe **Spanish**: Cuervo de Alaska

Taxonomy. *Corvus caurinus* S. F. Baird, 1858, Fort Steilacoom, Washington, USA.

May form a superspecies with *C. brachyrhynchos*, with which it appears to interbreed in S of range. Genetic swamping of unique features of present species may be accelerated by increasing expansion of *C. brachyrhynchos* facilitated by urbanization and agricultural development of formerly densely forested NW Pacific coast. Monotypic.

Distribution. S Alaska (E from Kodiak I) and coast and islands of SW Canada S in USA to NW Washington.



Descriptive notes. 42–45 cm; male 378–458 g, female 340–392 g. A small crow with medium-length tail and smallish bill. Plumage is entirely black, with purple sheen on head, neck, wing, tail and back; iris dark fuscous brown; bill glossy black; legs black. Differs from *C. brachyrhynchos* in generally smaller size, with hoarser voice and faster wingbeats, but generally indistinguishable in the field. Sexes similar, male on average larger than female. Juvenile (up to 3 months after fledging) is dull black, fluffy, and has blue iris; immatures like adult but less iridescent, often with brownish wings, tail and back. Voice. Likely as complex as that of *C. brachyrhynchos*, but not so well studied. Coarse, deep-pitched "craah" given in series to advertise territory. During mobbing, "kaar" at stationary predators and "kirrr" at end of dive at flying or perched predators. More drawn-out "craar" used as defensive call by both sexes; "aaag" as begging call by female, similar to typical begging call of nestlings and fledglings; small nestlings give "shreeh" while being fed, and older ones "creeach" gutturally with open beak to threaten. Copulation call loud, repeated, drawn-out "arghargh". Rattle like the pulling of a cork from a bottle, "errrrrr". High, falsetto "cowp" given in flocks. Nasal "neh" while perched and being mobbed by small birds.

Habitat. Restricted to beaches, rocky shores, tidelands, and river courses of coast and nearby islands. Historical restriction to coasts and islands lessened today as contiguous temperate rainforests have been cleared in many parts of species' range, thereby facilitating spread inland (typically to E) and colonization of towns, recreation areas and agricultural lands simultaneously with spread of *C. brachyrhynchos* NW into anthropogenic habitats. Degree to which crows in such anthropogenic landscapes are of present species and not *C. brachyrhynchos* (which has simultaneously spread N & E to overlap greatly in range, including at Hyder, in Alaska) is presently unknown.

Food and Feeding. Omnivorous, but specializing on marine and terrestrial invertebrates, especially crabs (Decapoda), clams, mussels, and carrion. Inland, flakes bark and moss in search of insects, scavenges human foods from recreation areas and refuse containers, and forages on the ground in gardens and along roadways. Preys on small vertebrates and eggs and nestlings of other birds. Eats native and planted fruits and nuts. Common at road-killed carrion. Large flocks may congregate along rivers to forage on emerging insects (hawked from air) and spawned-out salmon (*Oncorhynchus*). Routinely caches surplus food, especially the bounty from low tides, which it caches above high-tide line. Conspicuous in dropping nuts and especially bivalves on hard surfaces (roads and rocky coasts) in order to crack them; height from which items dropped is closely gauged to reduce loss and increase cracking. During autumn and winter, gathers at food bonanzas (towns, villages, salmon runs, dead marine mammals, agricultural fields, productive shores, and refuse dumps).

Breeding. Egg-laying Apr–Jun. Monogamous; occasionally (c. 20% of nests) with a single helper (offspring from previous year); loosely colonial. Bulky nest built by both members of pair, 35 cm in diameter × 23 cm tall, a coarse outer collection of sticks 15–30 cm long, finely woven inner cup (16 cm across × 9 cm deep) of grass, moss, soil and leaf litter, cup lined with moss, animal hair, feathers, cedar bark and human litter, placed usually in branch fork of tree or shrub at varying height (up to at least 50 m in old temperate rainforest), on some islands built on ground under tree or shrub (and then includes sparse outer stick structure); defended territory small, 0·12–0·94 ha. Clutch 3–6 eggs (average 4); incubation by female only, beginning when clutch complete, fed on and off the nest by the male, period 17–20 days; chicks fed by both sexes, and by helper if present, nestling period 32 days; all also feed young for up to a month post-fledging; young often mix with those from neighbouring nests at intertidal foraging locations within a few weeks of fledging. First breeding apparently at 2 years. Maximum observed lifespan 16 years 9 months; annual survivorship of breeders in areas with reliable food supply exceeds 95%.

Movements. Resident. Moves considerably outside breeding season to utilize locally abundant foods.

Status and Conservation. Not globally threatened. Populations of crows within the range of this species increased substantially in 1960s and 1970s. More recently, urban populations have increased, often exponentially, and most population assessments indicate general increases, with some local decreases. Local variation in degree of population increase may indicate movements, especially into growing human settlements, rather than population trends. Status of this corvid, however, remains unclear, as uncertain whether increases apply to present species or to *C. brachyrhynchos*; if they are a result of latter's NW range extensions, then the status of present species is bleak. Depending on extent of interbreeding between the two, it may may already be extinct as a distinct species; at best, "pure" individuals of present species likely exist today only on sparsely inhabited islands and coasts in N parts of its historical range. In order to resolve this matter, genetic investigation throughout the geographical range and across the time range during which specimens have been collected is needed.

Bibliography. Bayer (1989), Brooks (1942), Butler (1974), Butler *et al.* (1984), Emslie (1998, 2004), James & Verbeek (1983), Johnston (1961), Marzluff & Angell (2005), Marzluff & Neatherlin (2006), McCarthy (2006), Meinertzhagen (1926), Neatherlin & Marzluff (2004), Richardson & Verbeek (1986), Richardson *et al.* (1985), Robinette & Ha (2000, 2001, 2003), Verbeek (1982, 1995, 1998), Verbeek & Butler (1981, 1999), Zach (1978, 1979), Zwickel & Verbeek (1997).

98. American Crow

Corvus brachyrhynchos

French: Corneille d'Amérique **German**: Amerikanerkrähe **Spanish**: Cuervo Americano
Other common names: Common Crow

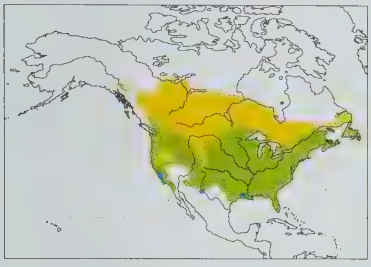
Taxonomy. *Corvus brachyrhynchos* C. L. Brehm, 1822, North America = vicinity of Boston, Massachusetts, USA.

Recent molecular-genetic studies suggest that this species might be most closely related to *C. corone* and that the two form a sister-taxon to the Caribbean *C. jamaicensis*, *C. nasicus* and *C. leucognaphalus*. Genetic similarity to *C. caurinus* unknown, but the two may well be a single species at present owing to present species' genetic swamping of former, probably accelerated by its NW range expansion (now extending N to Hyder, in Alaska), facilitated by urbanization and agricultural development of formerly densely forested NW Pacific coast. There appears to be no distinct boundary between nominate race and *hesperis*, and individuals of this species found N into SE Alaska and E to C Alberta, C Saskatchewan, Nevada, Arizona and New Mexico may include *hesperis*. Geographical variation largely clinal: in S USA, proposed races *paulus* (described from Alabama) and *hargravei* (Great Basin) synonymized with nominate. Known to hybridize in wild with *C. corax*. Three subspecies recognized.

Subspecies and Distribution.

C. b. brachyrhynchos C. L. Brehm, 1822 – S Canada from SW Northwest Territories E to Atlantic coast of Newfoundland, and S throughout Midwest and E USA to at least NW Florida and Gulf of Mexico; expanding W through Montana, Idaho, Wyoming, Utah, Colorado, Nevada and C Arizona.

C. b. hesperis Ridgway, 1887 – SW Canada (interior British Columbia) S in W USA to Washington, N Idaho, Oregon and California, and extreme NW Mexico (extreme NW Baja California).
C. b. pascuus Coues, 1899 – peninsular Florida.



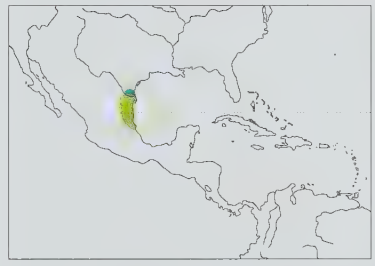
Descriptive notes. 43–53 cm; 250–575 g. A moderately sized crow rarely found far from humans. Plumage is all black with iridescent purple sheen, especially on back and wings; iris dark brown; bill and legs black. Distinguished from *C. ossifragus* by slightly larger size, less iridescent plumage, also by voice, habitat and timing of breeding. Sexes similar, male larger than female. Juvenile (up to 3 months after fledging) is duller black to grey-black, fluffier in appearance, with grey-blue iris; immature mostly black, with brown eyes, feathers of wing and tail often fading and wearing to brown, and contrasting with body plumage, outer rectrices narrower and more pointed than adults. Races differ only in size, nominate largest: *hesperis* is small, with especially small, straight bill; *pascuus* is intermediate in general size, with relatively large feet, long legs, and long bill. Voice. Large repertoire of more than 30 vocalizations (variously patterned, modulated and graded caws, soft calls, song, and mimicked sounds). Alarm calls, and likely all calls, have individually distinct elements; songs are socially learnt and may be culturally inherited as local dialects. Eight functional groups: (1) harsh, easily located assembly caws given to form a mob around dangerous, usually stationary, predators; (2) harmonic "koaw" calls disperse crows from danger; (3) tonal "ko" or warning caw, difficult to locate, alerts crows to presence of danger; (4) distress squalls and death cries given by captured individuals in grave danger mark especially deadly situations and locations; (5) wavering begging calls by juveniles or breeding females to stimulate feeding; (6) variety of cooing, snapping and groaning noises given at short distance among mates; (7) courtship or group songs that combine "cou" calls, rattles, growls, groans, other soft and unique noises, and posturing; and (8) mimicked natural and anthropogenic sounds, including of human voices.
Habitat. Common in human-dominated landscapes from core of large cities (where may nest on buildings) to parks, suburbs, golf courses, woodlands, some forests (especially deciduous and riverine ones, but also forest edges and open or fragmented coniferous forests), farms, orchards, ranches, and wildland recreation areas. Frequently found at refuse dumps, agricultural fields (especially maize), lawns, streets, shorelines, and along rivers. Historically, was found in deciduous forest landscapes, especially where forest openings, edges and small woodlots allowed diverse array of land covers to occur in proximity to one another; in response to human activities that have fragmented dense forest, planted trees in grasslands, watered arid lands, and otherwise increased the juxtaposition between rich food sources (notably open areas, agricultural fields, urban areas) and suitable nest-sites, this crow has greatly expanded its habitat use in the last 200 years.
Food and Feeding. Omnivorous, typically foraging on ground for invertebrates, notably earthworms (Lumbricidae), grasshoppers (Orthoptera), moth and butterfly larvae (Lepidoptera), and beetles (Coleoptera), also fruits, seeds, grains, carrion, and human food scraps. Preys on small birds, nestlings, eggs, small mammals (mice, voles, shrews), reptiles (snakes, lizards), amphibians (adult and larval toads and frogs), fish; also crabs and gastropods. Uses stout bill to dig, pry, flip, peel, scrape, grab, probe, pick and hammer to obtain food. Flycatches emerging insects. Chases flying insects and small birds, catching them in flight. Where conditioned with frequent rewards, may harass or beg from people for food. Occasionally uses artefacts, notably hard surfaces (and perhaps attendant automobiles), to crack thick-shelled nuts and invertebrates. Caches surplus food in subterranean, subnivian or arboreal locations, short-term memory of food locations well developed; long-term memory of danger, including aversive conditioning to food, feeding locations and individual people, well developed. Highly social, occurring in pairs or small family groups; in loose flocks of up to several thousand individuals when not breeding, and in even larger aggregations (hundreds to over a million birds) at communal roosts and along routes to and from such roosts.
Breeding. Nest-building from Feb to early Jun (1–2 months earlier than *C. ossifragus* where sympatric), progressively later from S to N, but accelerated by c. 1 month in warmer urban areas, most building by late May being renesting after initial failure; eggs laid late Mar to mid-Apr in most parts of range, May in N, peak hatching late Mar to Apr, peak fledging May–Jul in most locations. Socially monogamous, with long-lasting pair-bond; extra-pair copulations appear to be rare. Co-operative breeding (by 30–95% of pairs per year) reported throughout range except in migratory N populations (study needed), pair accompanied by up to ten helpers (mostly yearlings, but 6-year-olds known to help) which participate in territory defence, vigilance, and feeding of nestlings and fledglings. Nest defence tempered where persecuted but exaggerated in urban and suburban areas with no hunting; smallest territories (2-50 ha) in dense urban and suburban populations, where anthropogenic foods abundant, largest territories (200-400 ha) in rural areas; shown to recognize faces of individual human persecutors, with social and individual learning rapid, memory long-term (over 3 years). Nest variable in size, 17–76 cm wide × 10–38 cm high, made externally from sticks 6–35 mm in diameter, filled to some extent with dirt (mud early in season) and plant matter (stems, grass, maize stalks), rubbish and cow dung, lined with soft, shredded bark, grass, rootlets, moss, fibre, hair, leaves, pine needles or rubbish, inner bowl 16–36 cm in diameter and 10–20 cm deep; well concealed in wide variety of deciduous and coniferous trees (more often in conifer than expected from availability), usually near top (10–20 m in most of range) and above 30 m in tall conifer, less often in shrub, on building (including above 100 m on top of stadium), trestle or bridge support, and occasionally on ground; nest rarely reused, perhaps only in areas where sites especially limited (e.g. urban Seattle). Clutch 2–7 eggs (average 4·7), clutches of 2–3 eggs typical in some dense urban populations (e.g. Seattle) and remote wildland populations (e.g. Olympic Peninsula, in Washington); incubation by female alone, period 16–18 days; chicks fed by both parents and all helpers present, nestling period 33–43 days; parental care extends for several weeks to more than 4 months after fledging; juvenile dispersal varies greatly, some (typically males) remain for 1–5 years or more as helpers on natal territory, others travel at least 60 km (typically less than 20 km) to flock with others at reliable food sources (e.g. urban areas in Seattle); some birds that disperse from natal territory in autumn return before spring to help parents. Recorded longevity up to 14 years 7 months in wild and to 59 years in captivity; annual survivorship of adults in most areas very high (c. 95%), but can be significantly reduced in areas remote from most human activity; survival during first year of life varies from 35% (rural New York) to 45% (rural Illinois and Seattle) and to 55–63% (suburban New York and Los Angeles, respectively).
Movements. Migrates from N parts range, upper elevations, and drier, seasonal agricultural sites (e.g. E Oregon) after breeding (but increasing numbers remaining all year in N interior, e.g. Athabasca, in Alberta, and coastal towns e.g. Hyder, in Alaska). Flocks of 30–200 (occasionally 500–1000, rarely more than 2000) migrate S during autumn to SC USA (ringed indivivuals captured in Texas and Oklahoma); those from NE Canada and upper Midwest USA (Michigan, Wisconsin, Illinois) migrate to SE (ringed birds captured in Arkansas, Tennessee, North Carolina); W populations less migratory, appearing to stay throughout year in coastal areas and moving S & E from more seasonal areas (ringed birds tracked from British Columbia and Colorado S to Oklahoma and Arkansas, respectively). Longest movement by a ringed individual 2804 km, from Oklahoma to British Columbia. Spring migration (Feb–Apr) is conspicuous and rapid compared with that in autumn (Aug–Dec).
Status and Conservation. Not globally threatened. Common. Density variable; non-migratory crows occupy areas of up to 1000 ha or more throughout year, some defending exclusive breeding territories ranging from less than 1 ha to more than 100 ha; in areas where food widely scattered or less predictable crows wander over large, overlapping home ranges, e.g. home ranges of 300 ha to more than 10,000 ha on Olympic Peninsula overlap neighbouring ones by up to 48%. While Canadian population was stable, US population increased in accelerating manner from 1966 to 1997 (annual increases 0·8% during 1966–1971 and 1·5% during 1980–1997); exponential increases occurred in many W and urban areas during these decades (e.g. 30-fold increase in Seattle). Expanding and increasing populations led to increased predation on gamebird nests, damage to agriculture, possible spread of disease, and other nuisances to people. Systematic reduction of human subsides (food, water, nest-sites) would seem more effective at solving conflicts. With introduction of West Nile Virus to E USA in 1999 and its subsequent rapid spread across USA and S Canada, this species' populations have been dramatically reduced in parts of range; local populations declined steeply as 30–70% of all crows in marked populations died during epizootics, and regional populations declined by up to 45% across their range. Passive immunity, behavioural differences among the crows, and the patchy occurrence of West Nile Virus spared large numbers of this corvid in spite of high susceptibility to the disease. Vulnerability of highly social corvids, even widespread and increasingly abundant ones, to new challenges, especially exotic diseases, is illustrated by this species' response to West Nile Virus.
Bibliography. Brown (1985a, 1985b, 1985c), Caccamise *et al.* (1997), Caffrey (1992, 1999, 2000a, 2000b, 2001), Caffrey & Peterson (2003), Caffrey, Smith & Weston (2005), Caffrey, Weston & Smith (2003), Campbell *et al.* (1997), Caslavka &. Hanson (1974), Chamberlain & Cornwell (1971), Chamberlain-Auger *et al.* (1990), Clapp & Banks (1993), Clapp *et al.* (1983), Clark *et al.* (1991), Conner & Williamson (1984), Conner *et al.* (1975), Cristol (2001), Cristol *et al.* (1997), Davis (1958), Emlen (1936a, 1936b, 1938, 1940, 1942), Emslie (1998, 2004), Ericson *et al.* (2005), Feldman & Omland (2005), Frings & Frings (1957), Good (1952), Gorenzel & Salmon (1995), Grobecker & Pietsch (1978), Hauser & Caffery (1994), Heinrich (1988a), Houston (1969, 1977), Ignatiuk & Clark (1991), Johnston (1961), Kalmbach (1920, 1937), Kilham (1989), Knight *et al.* (1987), LaDeau *et al.* (2007), Lovette (2005), Lubinbuhl *et al.* (2001), Maccarone (1987c, 1991), Marzluff & Angell (2005), Marzluff & Neatherlin (2006), Marzluff, Boone & Cox (1994), Marzluff, McGowan *et al.* (2001), McCarthy (2006), McGowan (2001a), Meinertzhagen (1926), Moore & Switzer (1998), Neatherlin & Marzluff (2004), Parmalee (1952), Parr (1997), Pittaway (1988), Platt (1956), Price *et al.* (1995), Ratti (1984), Rea (1967, 1986b), Reaume (1987a, 1987b, 1988), Reineke (1995), Richards, D.B. & Thompson (1978), Richards, G.L. (1971), Root (1988), Sauer *et al.* (1997b), Schorgen (1941), Sinclair *et al.* (2003), Skagen *et al.* (1991), Stouffer & Caccamise (1991), Sullivan & Dinsmore (1990, 1992), Thompson (1968, 1969a, 1969b), Verbeek & Caffrey (2002), Whitmore & Marzluff (1998), Withey & Marzluff (2005), Yaremych *et al.* (2004), Yorzinski *et al.* (2006).

99. Tamaulipas Crow

Corvus imparatus

French: Corneille du Mexique **German**: Mexikanerkrähe **Spanish**: Cuervo Tamaulipeco
Other common names: Mexican Crow (when treated as conspecific with *C. sinaloae*)

Taxonomy. *Corvus imparatus* J. L. Peters, 1929, Río La Cruz, Tamaulipas, Mexico.
Forms a superspecies with *C. sinaloae* and possibly conspecific; preliminary genetic analysis suggests that the two may be sister-taxa (2% divergent) within a clade of Asian/Pacific taxa that includes *C. ossifragus*. Monotypic.
Distribution. NE Mexico (E from E Nuevo León) to N border of Veracruz; regularly occurs in extreme S USA (to immediately N of lower Rio Grande, in S Texas), but breeding unconfirmed.



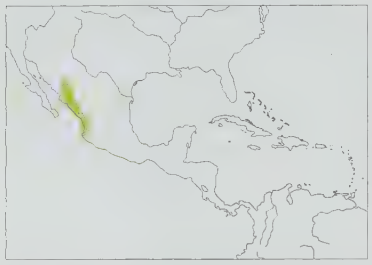
Descriptive notes. 34–40 cm; 192–237 g. A small, slender crow with comparatively small bill and highly glossed plumage. Has entire plumage black with rich purple, blue and green gloss; iris dark brown; bill and legs black. Differs from almost identical *C. sinaloae* in having slightly shorter tail. Sexes similar, male larger than female. Juvenile is dull black, with limited sheen, has dark dull grey bill and legs. Voice. Calls low-pitched, reedy, nasal, frog-like "nark", "gar" or "nar-ur", distinct from those of *C. sinaloae* (higher-pitched); calling often accompanied by puffing-out of throat feathers and lifting of tips of wings from back. Known calls burry, low-pitched, soft, and without clear harmonics, six described; croaking "gar-lic" or simply "gar" most common, used in variety of situations, including mobbing; "kawoo" and a quiet mutter given when calm; "rattling" and "begging" calls similar to those produced by most other corvids.
Habitat. Lowland, scrubby farmland, open woodland, towns and villages. Not strongly associated with beaches, but found along coast, especially in Tampico (S Tamaulipas), where it frequents coconut palms (*Cocos nucifera*). Sea-level to 300 m, occasionally to 800 m.
Food and Feeding. Omnivorous. Small groups seen foraging in semi-arid brushland. Regularly feeds in agricultural fields and refuse dumps around settlements. Co-operation in obtaining food seen in captivity, when flock-members passed food out of cage to escaped bird. Pairs to large flocks observed. Roosts communally.
Breeding. Poorly known in wild. Egg-laying in early Apr and fledglings in May. Apparently nests in loose colony. Coarse nest of sticks with rootlet lining, built by male and female. Clutch 4–5 eggs; incubation by female, period 17–18 days; no information on nestling period; dependence on parents extends throughout autumn and early winter, as begging calls heard into Nov.
Movements. Resident. Non-breeding birds wandering regularly to Brownsville (Texas) and N throughout lower Rio Grande Valley in winter.
Status and Conservation. Not globally threatened. Restricted-range species: present in Northeast Mexican Gulf Slope EBA. Locally abundant; has small range of c. 150 × 400 km. Observed in both summer and winter in Texas (at Brownsville refuse dump), breeding unconfirmed in USA. Tolerant of human activity, despite small range; utilizes human refuse and associated closely with pastures, farms, ranches, villages, and towns.
Bibliography. Arvin *et al.* (1975), Davis (1958), Goodwin (1986), Hardy (1990), Howell & Webb (1995), Johnston (1961), Lasley & Sexton (1989), Madge & Burn (1994), Peters (1929), Webber & Hardy (1985).

100. Sinaloa Crow

Corvus sinaloae

French: Corneille du Sinaloa **German**: Sinaloakrähe **Spanish**: Cuervo Sinaloense
Other common names: Mexican Crow (when treated as conspecific with *C. imparatus*)

Taxonomy. *Corvus sinaloae* L. I. Davis, 1958, Escuinapa, Sinaloa, Mexico.
Forms a superspecies with *C. imparatus* and possibly conspecific; preliminary genetic analysis suggests that the two may be sister-taxa (2% divergent) within a clade of Asian/Pacific taxa that includes *C. ossifragus*. Monotypic.
Distribution. NW Mexico on Pacific slope from S Sonora S to SW Nayarit.



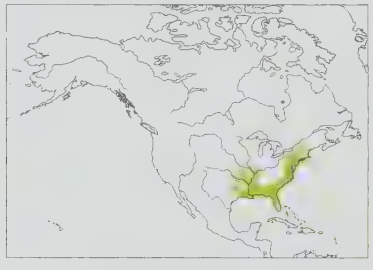
Descriptive notes. 34–38 cm; two birds 229 g and 258 g. A small, slender, glossy crow with relatively small bill. Entire plumage is black with rich purple, blue and green gloss; iris dark brown; bill and legs black. Differs from almost identical *C. imparatus* in having somewhat longer tail. Sexes similar, male larger than female. Juvenile is duller than adult, with limited sheen, has dark dull grey bill and legs. Voice. Little known. A clear, gentle, harmonically structured "ceow", most similar to that of *C. brachyrhynchos*, distinct from lower-pitched croaking call of *C. imparatus*; high hollow "caow" or "kwaa" also reported.
Habitat. Coastal lowlands, open and semi-open woodlands, thorn-forest, shrublands with saguaro-like *Pachycereus pecten-aboriginum* cacti, intertidal beaches, river courses, pastures, farms, ranches, towns and villages. Sea-level to 400 m, occasionally to 1000 m.
Food and Feeding. Omnivorous. Feeds in intertidal zone on marine invertebrates, including crabs (Decapoda) and shellfish. Elsewhere feeds on ground and in trees on insects, fruits and nuts. In Sonora, forages at rubbish dumps and preys on nestlings of other birds, including *Calocitta colliei*. Habitually turns over small stones, vegetation and detritus in search of food. Likely to use marine resources in same manner as does better-studied *C. caurinus*. Pairs to large flocks observed, but may be less gregarious than *C. imparatus*.
Breeding. Poorly known. In Sonora, nest-building from late May to early Jun, nestlings usually present in early Jul (after start of mid-Jun summer rains) and fledging from early Aug to early Sept. Loose colonies observed in Sonora. Nest made from coarse outer vegetation and fine inner material, placed in thorny, scrubby *Mimosa* tree, in tall coconut palm (*Cocos nucifera*), or above 3 m in crotch formed by vertical arm of *Pachycereus pecten-aboriginum* cactus. Clutch 4–5 eggs; no information on incubation and nestling periods.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Northwest Mexican Gulf Slope EBA. Locally abundant; has small range of c. 80 × 800 km, diverging from coast in N, where environment extremely arid. Tolerant of human activity, despite small range; utilizes human refuse and associated closely with pastures, farms, ranches, villages and towns.
Bibliography. Davis (1958), Goodwin (1986), Hardy (1990), Howell & Webb (1995), Johnston (1961), Madge & Burn (1994).

101. **Fish Crow**

Corvus ossifragus

French: Corneille de rivage **German**: Fischkrähe **Spanish**: Cuervo Pescador

Taxonomy. *Corvus ossifragus* A. Wilson, 1812, Great Egg Harbor [= Beasley's Point, New Jersey], USA.
Preliminary genetic analysis suggests that this species may be part of a clade of Asian/Pacific taxa that includes also *C. imparatus* and *C. sinaloae*. Monotypic.
Distribution. E & SE coastal reaches of USA from coastal Maine S throughout Florida, W across Louisiana border into E Texas, in W extending N along major rivers into Oklahoma, Kansas, Missouri, Illinois and Indiana.



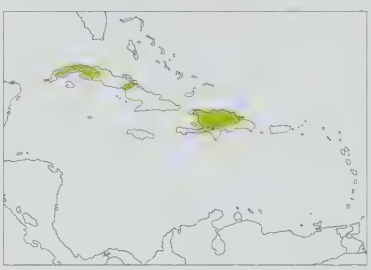
Descriptive notes. 36–41 cm; male 260–332 g, female 195–304 g. A small crow with proportionately rather long tail. Plumage is all black with bluish-violet and green gloss on head, upperparts and underparts; iris dark brown; bill and legs black. Distinguished from similar *C. brachyrhynchos* by substantially smaller size, relatively longer legs, and voice. Sexes similar. Juvenile (up to 3 months after fledging) is duller black than adult, fluffier in appearance, with grey-blue iris; immature mostly black, with brown eyes, often feathers of wing and tail brown and contrasting with body plumage. Voice. Relatively little known; repertoire of nine calls is limited compared with *C. brachyrhynchos*, from which best separated by more nasal voice, especially "uh-uh" call (similar to begging calls of latter). Short, nasal "awwr" indicates aggression, used to defend territory; shorter and higher-pitched "ewh" appears to be contact call, frequently given among flock-members; distinctive disyllabic nasal "uh-uh" may also be used for contact; predators mobbed with drawn-out "awwpp"; when delivering food to nest, parents give soft "feeding call" that alerts nestlings. Nestlings, fledglings and perhaps females beg from mates and parents with higher-pitched and drawn-out calls similar to "awwr"; disturbed young give similar call that sounds like "arrgh". "Aggressive rattle" given in flight or from perch at close distance to predators, aggressive conspecifics, or mobbing passerines. "Meow" heard once from male sitting near nesting female.
Habitat. Usually found close to water in coastal or riverine settings; exploits human settlements and, to lesser extent, agriculture. Abundant at refuse dumps in winter.
Food and Feeding. Eats variety of natural and anthropogenic foods, including carrion, crabs (Decapoda) and marine invertebrates, earthworms (Lumbricidae), grains and fruits, also household scraps. Preys on small vertebrates and eggs and nestlings of other birds, especially colonial waterbirds, e.g. herons (Ardeidae). Forages in trees, on ground, and in variety of human settings, including rubbish-containers in urban areas. Routinely caches excess food. Flocks of breeders and non-breeders roam in winter, congregating at locally abundant and dependable foods; often associated with humans (urban settings and landfills).
Breeding. Nest-building from late Mar to early Jun throughout range (1–2 months later than *C. brachyrhynchos* where sympatric) and egg-laying Mar–Jun. Pair-bond apparently monogamous and long-lasting. Adult helpers at nest not uncommon. Nests sometimes aggregated, with several in single tree or clump in areas of limited nest-site availability, but not truly colonial. Nest of modest size, 35–50 cm wide and 20–35 cm high, made externally with sticks 4–8 mm in diameter, filled to some extent with dirt and plant matter, lined with soft, shredded bark, moss, fibre, hair or pine needles (*Pinus*), inner bowl 13–19 cm in diameter and 13–15 cm deep, placed in tree; new nest built for each attempt; defends area around nest as small as 50 m in radius. Clutch 2–6 eggs (average 4·5); incubation by female alone, period 18–19 days; chicks fed by both parents, long nestling period 32–40 days; parental care extends for several weeks to more than a month after fledging. Oldest known individual lived for 14·5 years.
Movements. Extent of migratory behaviour poorly studied. Some may migrate from C or N portions of range to S coasts, but confusion with *C. brachyrhynchos* during winter makes evidence equivocal. Seasonal movements from breeding range to rich feeding locations common.
Status and Conservation. Not globally threatened. Common; most abundant in Florida; currently expanding N & W. Exploits human settlements and to lesser extent agriculture. Range-wide significant increase in population size of 1·6% per year (1966–1998); increase greatest during 1966–1979 (6% per year); apparently stable at present (0·8% per year). Less susceptible to West Nile Virus than are other corvids, and has not experienced significant local or range-wide declines since this disease emerged in USA. Hunted, but protected from indiscriminate shooting since 1972 (US Migratory Bird Treaty Act); availability of human provisions and protection within cities likely important factors in population growth and range expansion.
Bibliography. Fink (1975), Goodwin (1986), Hardy (1990), Johnston (1961), LaDeau *et al.* (2007), Madge & Burn (1994), Marzluff & Angell (2005), McGowan (2001b), McNair (1985), Meinertzhagen (1926), Sauer *et al.* (1997c).

102. **Palm Crow**

Corvus palmarum

French: Corneille palmiste **German**: Palmenkrähe **Spanish**: Cuervo Palmero
Other common names: Cuban Palm Crow (*minutus*); Hispaniolan Palm Crow (*palmarum*)

Taxonomy. *Corvus palmarum* Paul von Württemberg, 1835, vicinity of Cibao Mountains, Dominican Republic.
Appears to be more closely related to ravens than it is to other Caribbean crows; preliminary comparison of DNA sequences suggests 6% divergence from ravens, but 8–10% divergent from *C. leucognaphalus* and *C. nasicus*. Races have been treated as two distinct species, but differences minimal; indeed, even as races they are weakly differentiated. Two subspecies recognized.
Subspecies and Distribution.
C. p. minutus Gundlach, 1852 – Cuba.
C. p. palmarum Paul von Württemberg, 1835 – Hispaniola.



Descriptive notes. 34–38 cm; one male 315 g, one female 263 g. Small, rather tame crow with short, stout, sharp-pointed bill and well-developed nasal bristles covering nostrils. Nominate race has coarse black plumage with considerable purple-blue iridescence; iris brown; bill and legs black. Sexes similar, male slightly larger than female. Juvenile somewhat duller than adult. Race *minutus* slightly smaller and duller than nominate, and male tends to have larger tarsi and smaller bill. Voice. Calls poorly known, but those known are similar to "caw" of *C. brachyrhynchos* and to sequences of sharp, high-pitched "craa" of *C. ossifragus*. Also gives deep, harsh, burring sounds like a frog, which help to distinguish it from *C. nasicus* and *C. leucognaphalus*.
Habitat. Pine (*Pinus*) forests, arid brush, and hill country in Hispaniola, often at higher elevations (1300–1900 m) where pine trees intermingle with sparse woods and extensive corn agriculture on steep slopes; also in lowland forests, swampy forests, dry plains and wooded ravines. In Cuba, occurs in lowland cultivation with scattered palms.
Food and Feeding. Omnivorous. Feeds on invertebrates, including beetles (Coleoptera), caterpillars, cicadas (Cicadidae), snails (Gastropoda), small vertebrates (lizards), and fruits; not known to eat carrion, but diet studies lacking. Forages in trees and on ground in pairs or small groups of up to 20 individuals.
Breeding. Poorly known. Season Mar–Jul in Cuba; eggs laid in Apr. Presumed solitary nester on exclusive territory. Small groups (3–6) commonly seen, especially when mobbing potential predators. Builds typical crow nest with coarse stick platform lined with dry grasses and other soft materials, placed among tree branches or at base of palm frond; one was 10 m above ground in pine tree. Clutch 4 eggs; no information on incubation and nestling periods.
Movements. No information.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Cuba EBA and Hispaniola EBA. Not uncommon in Hispaniola, but mainly in lowland and hill forests; formerly abundant, but distribution has narrowed and populations have declined in response to extensive forest clearance, especially in Haiti. Rare in Cuba, where likely now confined to Camaguey province. Was killed for food in 19th century, its flesh apparently being considered delicious.
Bibliography. Anon. (2008p), Bond (1936), Butchart & Stattersfield (2004), Danforth (1929), Garrido & Kirkconnell (2000), Garrido *et al.* (1997), Goodwin (1986), Holyoak (1983), Johnston (1961), Keith *et al.* (2003), Madge & Burn (1994), Meinertzhagen (1926), Stattersfield & Capper (2000), Wetmore & Swales (1931).

103. **Jamaican Crow**

Corvus jamaicensis

French: Corneille de Jamaïque **German**: Jamaikakrähe **Spanish**: Cuervo Jamaicano
Other common names: Chattering/Jabbering Crow

Taxonomy. *Corvus jamaicensis* J. F. Gmelin, 1788, Jamaica.
May form a superspecies with *C. nasicus* and *C. leucognaphalus*. Monotypic.
Distribution. Jamaica.
Descriptive notes. 35–38 cm; two birds 336 g and 339 g. Smallest and dullest Caribbean crow; body plumage loose and soft, nostrils of some individuals fully exposed. Has head, face and throat black, base of neck feathers grey, rest of plumage mostly dark, dull grey or sooty black, back greyish-black with hint of brown; some violet iridescence in wings, tail and neck; iris grey-brown or reddish-brown (possibly indicating age or sex), bare suborbital patch evident on most individuals; bill slate-grey; legs black. Sexes similar, male slightly larger than female. Juvenile undescribed. Voice. Remarkably variable, especially jabbering outbursts, which are frequent in social gatherings and include mix of chuckling, chattering and gobbling, strung together in a garbled melody, once described as "like a half dozen Welshmen quarrelling"; known to croak like raven and to give harsh "craa craa" sound like *C. frugilegus*.



Habitat. Wet limestone forests, mountain pastures, wooded hills and open parkland, including landscapes with settlement and agriculture. Early explorers emphasized association with wild, high-elevation (above 600 m) forests. Recent observations suggest a wider distribution and use of low elevations during dry season.
Food and Feeding. Omnivorous. Consumes variety of fruits, e.g. bitterwood (*Picrasmas excelsia*), pimento (*Pimenta pimenta*), soursop (*Annona muricata*), banana (*Musa sapientum*), plantain (*Musa paradisiaca*), wild fig (*Ficus trigonata*), wattle-wood (*Laetia thamnia*) and burnnose (*Daphnosis tinifolia*), also arthropods, primarily from forest canopy. Also probes bromeliads, pries bark, and digs into rotting wood in search of invertebrates. Preys on eggs and nestlings of other birds, especially wild pigeons (Columbidae). Steals snared small birds. In Worthy Park, observed to carry an orange and a frog. In pairs and small groups.
Breeding. Poorly known. Presumed solitary nester in exclusive territory. Nest high in tree or possibly in natural cavity. No information on season, clutch size, and incubation and nestling periods.
Movements. No information. Appears sedentary and territorial during breeding season, but may wander in small groups during non-breeding season.
Status and Conservation. Not globally threatened. Restricted-range species: present in Jamaica EBA. Locally common and perhaps expanding range in Westmoreland and Manchester; common in Cockpit Country, Moneague, Good Hope, Worthy Park, and John Crow Mts. Rare or absent in Blue Mts. Despite use of some open habitats, possibly at some risk due to extensive forest clearance.
Bibliography. Bond (1936), Cruz (1972, 1974), Fletcher (2006), Goodwin (1986), Gosse (1847), Johnston (1961), Lack (1976), Madge & Burn (1994), Meinertzhagen (1926).

104. Cuban Crow

Corvus nasicus

French: Corneille de Cuba **German**: Kubakrähe **Spanish**: Cuervo Cubano

Taxonomy. *Corvus nasicus* Temminck, 1826, Cuba.
May form a superspecies with *C. jamaicensis* and *C. leucognaphalus*. Monotypic.
Distribution. Cuba, I of Pines, and S Bahama Is (Providenciales, North Caicos, Grand Caicos).



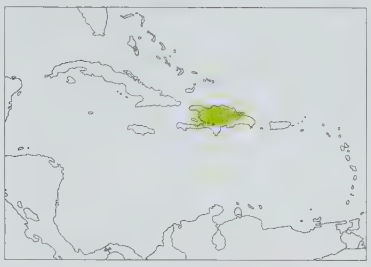
Descriptive notes. 40–42 cm; 330–510 g. A moderate-sized crow with upturned nasal bristles that do not cover nostrils; relatively long bill. Plumage is deep black with slight blue-purple gloss, body feathers with grey bases; iris brown, patch of bare skin behind eye and at base of bill; bill and legs black. Distinguished from *C. palmarum* by longer and less stout bill, and by longer wings and slower, heavier wingbeats in flight. Sexes similar, male slightly larger than female. Juvenile is slightly duller than adult. Voice. Vocalizations quite musical, and less nasal and abrupt than those of *C. palmarum*. Ringing, high-pitched "aaaaauh" rising in inflection, liquid bubbling, trilling and chattering similar to sounds made by *C. jamaicensis*. Raven-like croaks and guttural chatter of great variety.
Habitat. Forests and woodlands, including villages and towns with substantial tree cover. Uses edges and semi-cleared forest, wooded cultivation and agricultural areas, including those with grains and fruits.
Food and Feeding. Omnivorous. Feeds in trees and on ground on invertebrates, fruits and berries. Formal dietary studies lacking. Often observed in small, noisy groups. Readily flocks with *C. palmarum*. Singly and in pairs, sometimes in larger groups.
Breeding. Season Mar–Jul. Nest a coarse stick platform lined with dry grasses, feathers and other soft materials, placed in palm, among tree branches or on large bromeliad in tree. Clutch 3–4 eggs; no information on incubation and nestling periods.
Movements. No information.
Status and Conservation. Not globally threatened. Common to locally abundant. Often persecuted by man, and may have been reduced in numbers as extensive forests have been cleared. Use of partially cleared forest, edges, agricultural areas and settlements reveals adaptation to human activities.
Bibliography. Bond (1936), Buden (1992), Garrido & Kirkconnell (2000), Garrido *et al.* (1997), Goodwin (1986), Johnston (1961), Madge & Burn (1994), Meinertzhagen (1926), Olson & Hilgartner (1982).

105. White-necked Crow

Corvus leucognaphalus

French: Corneille d'Hispaniola **German**: Antillenkrähe **Spanish**: Cuervo de la Española

Taxonomy. *Corvus leucognaphalus* Daudin, 1800, Puerto Rico.
May form a superspecies with *C. jamaicensis* and *C. nasicus*. Monotypic.
Distribution. Hispaniola.
Descriptive notes. 42–46 cm. The largest Caribbean crow; long (35–49 mm) and tapered bill, nasal bristles upturned and sweeping over culmen ridge, intense plush-like black feathers at base of culmen between bill and eye. Plumage is black with purple or blue gloss, body feathers with white bases (concealed white bases give rise to name); iris red-brown (yellow iris also reported, possibly age-specific), bare skin about bill base and below eye; bill and legs black. Sexes similar, male slightly larger than female. Juvenile is slightly duller than adult. Voice. Raven-like, including guttural "culik-calow-calow", deep "wallough", and variety of high-pitched musical notes, e.g. "klook"; does not "caw" like a typical crow.
Habitat. Most closely associated with old, mature forests in mountainous and hilly, inaccessible country; also coastal mangrove swamps and cactus forests.
Food and Feeding. Omnivorous. Formal dietary studies lacking. Feeds in large flocks on seasonally abundant fruits, primarily in forest canopy. Known to eat drupes of *Dacryodes excelsa*; also tree-toads and passerine nestlings. Formerly seen in large foraging flocks, commuting between



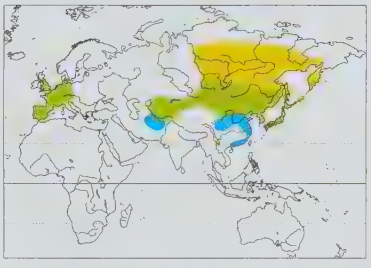
mountain roosts and lowland feeding areas; strong, graceful flier, travelling long distances high in air.
Breeding. Poorly known. Season Feb–Jun; eggs and well-grown young observed in Mar in Puerto Rico (now extinct) and nests in early May in Haiti. Builds a typical crow nest, a coarse stick platform lined with dry grasses and other soft materials, placed among tree branches, one was high in a palm, another high in a pine tree (*Pinus*). Clutch 3–4 eggs; no information on incubation and nestling periods.
Movements. No formal study. Casual visitor to islands of Gonâve and Saona.
Status and Conservation. VULNERABLE. Restricted-range species: present in Hispaniola EBA and (formerly) Puerto Rico and the Virgin Islands EBA. Rarest crow in Caribbean. Now exists only on Hispaniola; last recorded Puerto Rico in 1963 and considered extinct there (more recent possible sightings around El Yunque may be escaped pets). Severe population declines of this once widespread species were noted in early 20th century, and continue to this day. Was valued as a gamebird, with delicious flesh, and was hunted extensively; moreover, its habitat has been largely destroyed by forest clearance.
Bibliography. Anon. (2007b, 2008p), Bond (1936), Butchart & Stattersfield (2004), Garrido *et al.* (1997), Goodwin (1986), Johnston (1961), Keith *et al.* (2003), Madge & Burn (1994), Meinertzhagen (1926), Stattersfield & Capper (2000), Wetmore (1927), Wetmore & Swales (1931), Wiley (2006).

106. Carrion Crow

Corvus corone

French: Corneille noire **German**: Rabenkrähe **Spanish**: Corneja Negra
Other common names: Common/Eurasian Crow (with *C. cornix*); Eastern Carrion Crow, Oriental Crow (*orientalis*)

Taxonomy. *Corvus Corone* Linnaeus, 1758, England.
Thought to form a superspecies with *C. cornix*, possibly also including *C. pectoralis*; was for long treated as conspecific with former. Situation complex, as narrow bands of hybridization between present species and *C. cornix* exist across Scotland, through C Europe, in C Siberia and in C Asia, but striking plumage differences, subtle differences in vocalizations, and both narrowness and plasticity of hybrid zones all suggest that speciation has been at least partially achieved. Presence of "black crows" over both W & E regions of Eurasian landmass, separated by *C. cornix*, is noteworthy; preliminary research indicates that these black populations may merit treatment as two separate species, but more extensive investigation required. Within extensive range of E populations (*orientalis*) there is a cline of increasing bill size from W to E, which has prompted the describing of a further three races: *interpositus* (described from Japan), *saghalensis* (from Sakhalin I) and *yunnanensis* (from S Yunnan, in China) are all regarded as synonyms of *orientalis*. Two subspecies currently recognized.
Subspecies and Distribution.
C. c. corone Linnaeus, 1758 – Britain (except N Scotland), France, Spain and Portugal E to Denmark, W Germany, Czech Republic, Slovakia, Austria, N Italy and Switzerland; many C European birds disperse S & W in winter, reaching Corsica, Sardinia and SE Europe.
C. c. orientalis Eversmann, 1841 – breeds from C Siberia (Russia) and N Mongolia from R Yenisei E (N to N limit of taiga) to Kamchatka, Kuril Is and Sakhalin I, and from C Kazakhstan, E Turkmenistan, NE Afghanistan and extreme NW Indian Subcontinent E through Tien Shan and across N China (S to N Qinghai, N Sichuan and Hebei, with isolated population S Yunnan) E to Japan (S to Kyushu); N populations migrate S to E & SE China, also S to NE Iran, Baluchistan and N Pakistan (NorthWest Frontier Province) in winter.



Descriptive notes. 48–53 cm; 396–602 g. A rather compact archetypal crow with relatively flat crown running onto slightly arched culmen. Plumage is wholly black, greenish hue on head and wings becoming more purplish-red on rest of upperparts, the lower underparts dull black; in worn plumage, becomes very dull, unglossed black overall; iris dark brown; bill and legs black. Differs from *C. frugilegus* in head shape, less glossy plumage, less prominent feathering on thighs, in flight by having tail more gently rounded at tip, wings appearing rather broader and less fingered (impression created by slightly shorter "hand"). Sexes similar. Juvenile has plumage duller and rather looser, more sooty black, than adult, also greyer iris and pinkish-red interior of mandibles (grey in adults), and may show pale or fleshy gape-flanges into first autumn; birds with whitish patches on wings (on some forming a band along whole length of wing, at bases of primaries and secondaries) are not unusual, and seem invariably to be first-years. Races differ only in size: *orientalis* is on average larger than nominate, and has larger, stouter bill (largest in E of range). Hybrids between present species and *C. cornix* vary from being almost wholly black with scattered grey feathers on mantle and breast to being *cornix*-like with blackish markings. Voice. Typical call a flat, dry "aaaah" or "kraaah", repeated on same pitch c. 3–6 times, varying somewhat in strength of delivery. Also sometimes gives an almost raven-like "konk-konk", but this usually accompanied by more typical call notes. Song rarely noticed, a bubbling mixture of call notes interspersed with some mimicry.
Habitat. Inhabits a huge variety of open country, preferably with at least scattered trees. Favours mixed farmland, parks and gardens, also by forest clearings, and equally at home on moorland and on inshore islands, coastal cliffs and estuarine flats. Nominate race ascends to 2000 m in Swiss Alps; *orientalis* reaches 3600 m in parts of C Asia.
Food and Feeding. Omnivorous, but chiefly a carnivorous scavenger. Diet varies according to local habitats, but consists basically of invertebrates, especially earthworms (Lumbricidae), small mammals, frogs, bird eggs and nestlings, as well as carrion; in addition, small amounts of grain and weed seeds taken. Feeds almost entirely on ground, turning over seaweed, dung or stones to get at insects and other invertebrates. Although not known for its agility in the air, will pursue other birds to make them drop or regurgitate food items. Surprising number of reports of attempting to catch birds in flight: Common Starling (*Sturnus vulgaris*) was successfully captured in full flight, Common Woodpigeon (*Columba palumbus*) taken, and Northern Lapwing (*Vanellus vanellus*) forced to

the ground by three crows was killed by one of them; attempt to capture Barn Swallows (*Hirundo rustica*) on the wing seems not to have been successful. Opens shellfish by flying high before pausing and dropping them on to a hard surface, repeating the performance several times if necessary. Pairs patrol roadsides in early mornings for roadkill carrion, or forage along lakeshores, across intertidal mudflats and along seashores, searching for both dead and live food items. Exceptionally, recorded as picking dead and live fish from surface of lake, even hovering briefly while doing so, sometimes using feet, as well as by picking from surface with bill. Although forages among taller grass than do other corvids, prefers newly mown hayfields and fresh stubble following harvest, where considerable numbers may assemble. Several observations of food-hoarding, but this habit seems to be less widespread than it is among several other corvids. Often encountered in pairs or family parties, and assemblages of 50–100 can gather at favoured feeding sites such as rubbish dumps and tidal mudflats. Larger numbers, up to 5000, may roost in mixed flocks in stands of large trees. Often indulges in apparent "play" activities, including repeatedly sliding down sloping roof, or hanging upside-down and swinging by feet from washing line or telephone wires.

Breeding. Season commences late Mar in Britain, peak egg-laying mid-Apr, and dates similar in W Europe overall; E race *orientalis* more varied over more extensive range, generally early Apr in Ussuriland (SE Russia), late Apr in C Asia but not until late May or early Jun on Kamchatka in far N; single-brooded. Monogamous long-term pair-bond, pair-members keeping together throughout year (even when flocking); pair has home range of c. 14–49 ha, which contracts during breeding season, when adults defend nest against potential predators, chiefly other crows. Solitary nester, but rarely two and exceptionally three active nests in one tree. Nest built by both sexes, female doing bulk of the work, work normally taking 20 days (but nest can be built in 6–7 days if a replacement after failed first attempt); a rather large structuire based on sticks and twigs, often mixed with rabbit (*Oryctolagus*) bones or wire and heather (Ericaceae) twigs, mud pushed into base to give a solid foundation, deep cup thickly lined with soft materials such as wool, animal fur, soft grasses, feathers and paper; built mainly in crown of tall tree, normally a fresh nest built each year, although in some cases (where availability of nest-sites limited) an old nest repaired and reused; in more open habitats electricity pylons provide nest-sites, whilst on exposed coasts cliff ledge or stunted shrub may be used; some nests built on old buildings, in reedbeds, or even on ground, sheltered by heather, stone wall or rocks. Clutch almost invariably 4 eggs; incubation almost entirely by female, fed on or near nest by male for first 9–10 days, male sometimes taking over for short stints, period 17–22 days; chicks fed by both parents, leave nest after 30–34 days; young dependent on adults for several further weeks; in autumn many young join up with flocks of non-breeders at key sites, whereas others remain with parents for the first winter. Nest occasionally parasitized by Great Spotted Cuckoo (*Clamator glandarius*) in Spain. Able to breed when 15–17 months old. As with other large corvids, old nests used by a number of other birds, including Long-eared Owls (*Asio otus*), sparrowhawks (*Accipiter*) and various falcons (*Falco*).

Movements. Nominate race basically resident, although birds from interior of Continental Europe show tendency to disperse SE, S & SW in winter, some reaching E Hungary, W Ukraine, S Spain, Gibraltar and rarely even N coastal Morocco; vagrants reported also from various parts of Balkans, S Italy, Sicily, Corsica and, exceptionally, Atlantic islands (Madeira, Azores) and Kola Peninsula (NW Russia). In spring, presumed overshooting returning migrants annual in S Sweden and W Norway. E race *orientalis* also a partial migrant, N birds moving S, many reaching coastal lowlands of Hong Kong, South China Sea and inland to S China (but wintering also in W Mongolia); has occurred as vagrant in N Vietnam. Migration numbers and routes unclear (owing to potential confusion with E race of *C. frugilegus*), but first arrivals appear in Yakutia (Arctic Circle) around mid-Mar, joining few which sometimes have overwintered there; large flocks form in Sept, prior to moving S, these moving out in latter half Oct; on Sea of Okhotsk coast first arrivals on Shantar Is on 10th Apr, with last passing up to very end of Nov. Winter dispersal takes birds across Pakistan, vagrant having reached Karachi, but not found S of Kashmir (although breeding in Ladakh); farther W in C Asia flocks form in wintering areas, notably in W Turkmenistan, some penetrate into NE Iran. This dispersal may account for occasional vagrant occurrence in E Turkey and Lebanon (i.e. it is possible that these are *orientalis* rather than wanderers from W Europe). Vagrant S to Ryukyu Is and Izu Is, and even Bonin Is (where formerly nested).

Status and Conservation. Not globally threatened. European nominate race abundant, with population of 2,000,000–3,000,000 pairs: Britain 790,000 (spreading N, now in C Scotland), France 200,000–1,000,000 (increasing), Belgium 16,000, Netherlands 50,000–80,000, Luxembourg 8000–10,000, Germany 320,000–400,000, Spain 320,000–530,000, Portugal 1000–10,000, Switzerland 80,000–150,000, and Denmark 300–4000. Although having for long been persecuted as "vermin" by gamekeepers and farmers because of its egg-stealing and nest-robbing habits, over much of its European range this corvid is now increasing, Reduction in keepering intensity since 1920s has allowed a steady increase, which accelerated in 1950s as creation of larger suburban gardens and city and town parks provided habitats safer from human persecution. E race *orientalis* also common over most of its huge range, although seems to be scarce at S limits of in NE Afghanistan, Kashmir and Yunnan. In Japan, it is common on N islands S to Kyushu.

Bibliography. Ali & Ripley (1972, 1987b), Beaman & Madge (1998), Blinov & Kryukov (1992), Blinov *et al.* (1993), Brazil (1991), Chen Fuguan *et al.* (1998), Cook (1975), Coombs (1978), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Goodwin (1986), Grimmett *et al.* (1998), Haffer (1993h), Hagemeijer & Blair (1997), Higuchi (1979), Holloway (1996), Kryukov & Blinov (1994), Madge (2000), Madge & Burn (1994), McCarthy (2006), Meise (1928), Melde (2004), Prior (2007), Rasmussen & Anderton (2005b), Roselaar (1995), Saino & Scatizzi (1991), Sangster *et al.* (1997), Stepanyan (1990, 2003), Vaurie (1954, 1959), Williams *et al.* (1992).

107. Hooded Crow

Corvus cornix

French: Corneille mantelée **German**: Nebelkrähe **Spanish**: Corneja Cenicienta
Other common names: Common/Eurasian Crow (with *C. corone*); Mesopotamian Crow (*capellanus*)

Taxonomy. *Corvus Cornix* Linnaeus, 1758, Sweden.

Thought to form a superspecies with *C. corone*, possibly also including *C. pectoralis*; was for long treated as conspecific with former. Situation complex, as narrow bands of hybridization between present species and *C. corone* exist across Scotland, through C Europe, in C Siberia and in C Asia, but striking plumage differences, subtle differences in vocalizations, and both narrowness and plasticity of hybrid zones all suggest that speciation has been at least partially achieved. British Is present a most interesting distributional jigsaw, with present species throughout Ireland, I of Man, N Scotland and Scottish isles, being replaced by *C. corone* over England, Wales and S Scotland; this suggests that present species had colonized from E, probably being the original British crow, but N-spreading *C. corone* from France or Spain colonized S England; meanwhile, Ireland and I of Man had separated from mainland Britain before England became separated from continental Europe. The spread continues today, with Scottish band of hybrids creeping N as black-plumage genes obliterate grey genes. Nominate race intergrades with *sharpii* in region of Urals. In E Europe and W Asia there is a cline of increasing paleness and smaller size from N to S, but complicated by bleaching, and several other described races are best treated as synonyms: thus, *khozaricus* (described from S Russia) is synonymized with nominate, and *kaukasicus* (Caucasus region), *sardonius* (Sardinia), *italicus* (Italy) and *minos* (Crete) are treated as synonyms of *sharpii*. Extreme S race, *pallescens*, is at palest end of cline, is relatively small and rather weak-billed, and contrasts markedly with the almost black-and-white, large-billed *capellanus* of Iraq and extreme SW Iran, suggesting that latter may well have evolved to full species level. Four subspecies recognized.

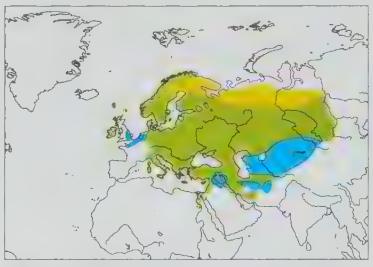
Subspecies and Distribution.

C. c. cornix Linnaeus, 1758 – Faroe Is, N Scotland, Ireland and I of Man E throughout Fennoscandia and W Russia to Urals, S in Europe to Hungary and NW Romania, N Balkans, N Italy and Corsica; some N birds move S or SW in winter, reaching as far as W France.

C. c. sharpii Oates, 1889 – Urals E in Siberia to R Yenisei, C Asia, Iran, Turkey (except S), from Caucasus W through S Ukraine to S Balkans, Crete and S Italy (including Sardinia and Sicily); N populations migrate S to as far as Afghanistan.

C. c. pallescens (Madarász, 1904) – Cyprus, S Turkey E to N Iraq, S to Egypt, Israel and Jordan.

C. c. capellanus P. L. Sclater, 1877 – Euphrates Valley of lowland Iraq (reaching N to Kirkuk) and E into SW Iran (as far as Bushire).



Descriptive notes. 48–54 cm; 396–602 g. Size, structure and habits are basically as for *C. corone*. Nominate race has black hood formed by glossy black crown, upper nape, side of head, throat and "breastplate" (lower border of breastplate somewhat irregular); tibia and both wing surfaces and tail also black, and uppertail-coverts variably blotched blackish and grey; rest of plumage, including nape, side of neck, mantle, scapulars, rump and some uppertail-coverts, remaining underparts and axillaries ashy grey with fine dark shaft streaks; through wear, black areas of plumage become dull and unglossed; iris dark brown; bill black; legs dark grey. Sexes similar. Juvenile has duller and rather looser, softer, more brown-toned grey plumage than adult, lacking dark shaft streaks on body feathering, also has greyer iris and pinkish-red interior of mandibles (dark grey in adult), and may show pale or fleshy gape-flanges into first autumn. Races differ mainly in size and plumage tone, variation chiefly clinal: *sharpii* is paler grey than nominate, W birds tending to be larger than those in E; *pallescens* is smaller and even paler grey than previous; *capellanus* is distinctive, large and stout-billed, with extremely pale grey body plumage, appearing almost black and white in the field (especially when plumage worn). Hybrids with *C. corone* variable, some being like present species but with blackish markings on mantle or lower underparts, others almost wholly black with scattered grey feathers on mantle and breast. Voice. Much as for *C. corone*, but a certain amount of regional variation of a fairly varied vocabulary complicates interpretation of differences. Most frequently heard call a slightly softer, more rolling "aaarrr", less hoarse than that of *C. corone*; some evidence to suggest that some basic vocalizations may have different meanings for the respective species. Race *capellanus* said to have a deeper and gruffer voice than others.

Habitat. Open country with at least scattered trees. Favours mixed farmland, parks and gardens, from city centres to forest clearings, and equally at home on moorland as it is on inshore islands, coastal cliffs and estuarine flats. Tolerates humans more so than does *C. corone*, being far more approachable and quite numerous in the streets of many cities. With encroachment of cultivation into the desert (e.g. in Israel), it has now come into contact with *C. ruficollis*, but it keeps very much to lusher areas of cultivation and does not tolerate true arid conditions. Breeds at up to 1350 m in the Tatra Mts (Poland–Slovakia); recorded to 1000 m in the Carpathians and the Urals, 1125 m in the Altai and 2050 m in the Saraibulag Range of Armenia. In hybrid/overlap zone in E Alps, there is a tendency for *C. corone* to occupy higher elevations than the lowland-haunting present species.

Food and Feeding. Omnivorous, but chiefly a carnivorous scavenger. Diet varies according to local situations and season, but basically invertebrates, especially earthworms (Lumbricidae) and insects, also small mammals, frogs, bird eggs and nestlings, and carrion; also takes small amounts of grain and weed seeds. Fledglings fed almost entirely on insects through early summer, switching to higher levels of grain and weed seeds in autumn and winter. Forages almost entirely on ground, turning over seaweed, dung or stones to get at insects and other invertebrates; chases other birds to make them drop or regurgitate food items. Pairs patrol roads and tidal shorelines for carrion, or forage along lakeshores, across mudflats and along seashores, searching for dead or live food items. Sociable, in pairs and small groups; sometimes larger flocks. Roosts singly, in pairs or in small to large gatherings (up to several thousand, especially in winter), usually in trees or on cliff faces, but in open areas among heather on open moorland.

Breeding. Season commences late Mar in Britain, peak egg-laying mid-Apr; at S limit of range, eggs from end of Jan in Egypt, Feb in Israel and Persian Gulf, mid-Mar in Iraq (*capellanus*) and Georgia; oddly, laying said to be in May in Greece; farther N, laying begins in mid-Apr in N Caspian region and N Caucasus foothills, about third week in Apr in Moscow region, and May in Finnish Lapland; single-brooded. Monogamous long-term pair-bond, partners keeping together through most of year, but bond less strong when flocking. Solitary breeder, although generally more sociable than *C. corone* even in breeding season, when can form loose colonies; inter-nest distance 20 m in parts of Moscow. Nest built by both sexes, often female doing construction whilst male collects materials, fresh nest can be built in 7–8 days; rather bulky, based on sticks and twigs, often mixed with animal bones, sheep wool and heather, mud pushed into base to give it a solid foundation, deep cup thickly lined with soft materials such as wool, fur, soft grasses and the like, usually placed in crown of tall tree; normally fresh nest built each year, but in some places where availability of sites is limited an old nest may be repaired and reused; in more open habitats electricity pylons provide nest-sites, and on exposed coasts a cliff ledge or stunted shrub may be used; some nests built on old buildings or even on the ground, sheltered by heather, a stone wall or rocks. Clutch usually 4–5 eggs; incubation by female, period 17–20 days; chicks fed by both parents, nestling period 3–5 weeks; young somewhat dependent on parents for a further 2–3 weeks and often throughout first winter; in late summer family unit normally breaks up as juveniles join foraging flocks, either with or without adults. Nest occasionally parasitized by Great Spotted Cuckoo (*Clamator glandarius*) in E Mediterranean region. Capable of breeding at 2 or 3 years of age.

Movements. Resident in W & S; N and interior birds move S in autumn (Sept–Nov) to varying degrees, many remaining about towns and settlements even in far N in milder winters. Birds from Scandinavia and E to C Finland winter in countries bordering S coast of North Sea, those of E Finland wintering chiefly NE Germany and N Poland. Formerly substantial numbers wintered across W Europe to N France and E England, but far fewer have done so in recent decades (presumably because birds remain in towns and villages in breeding areas). Breeders from W Russia E to the Urals move S to Volga Delta and nearby steppes; those from farther E migrate to Kazakhstan, Turkmenistan and Afghanistan, a few reaching Pakistan, W China (Xinjiang) and extreme NW India. Vagrants reported from Greenland, Jan Mayen, Bear I, Iceland, Svalbard, Novaya Zemlya,

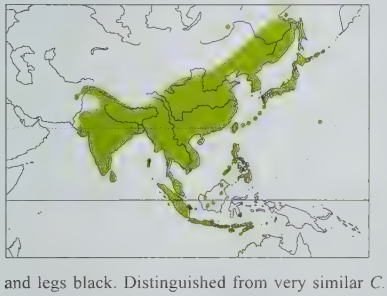
Malta, Tunisia and Libya, most of which referable to overshooting on spring migration (Mar–May). At migration times, can assemble in thousands at key points.
Status and Conservation. Not globally threatened. Abundant, with apparent population increases over recent decades in most European countries, most notable being its spread into cities from the countryside. Densities vary with location; in Moscow city area as high as 32–36 pairs/km², whereas in agricultural land nearby only c. 2–3 pairs/km². Reports from Egypt indicate a dramatic decline in populations of Nile Delta, which could be linked to pesticides. Following estimates (pairs/territories) have been made for most countries within W Palearctic: Faeroe Is 500–1000, Scotland & I of Man 160,000 (plus 20,000 hybrids), Ireland 290,000, Germany 63,000–84,000, Denmark 21,000–220,000, Norway 200,000–600,000, Sweden 250,000–500,000, Finland 200,000–300,000, Estonia 50,000–100,000, Latvia 20,000–60,000, Lithuania up to 70,000, Poland 50,000–100,000, Slovakia 15,000–30,000, Hungary 70,000–80,000, Italy 110,000–520,000, Greece 150,000–200,000, Albania 10,000–30,000, Croatia 110,000–150,000, Slovenia 8,000–12,000, Bulgaria 500,00–1,000,000, Romania 30,000–50,000, Russia 1,000,000–10,000,000, Belarus 280,000–320,000, Ukraine 450,000–500,000, Moldova 7000–10,000, Azerbaijan 8000–10,000, Turkey 100,000–1,000,000, Israel c. 20,000, Egypt 10,000–100,000. Has long been persecuted by gamekeepers and farmers owing to its egg-stealing and nest-robbing habits; over much of its European range, however, it is now increasing, finding that city and town parks as well as rubbish dumps provide not only easy scavenging, but also habitats safer from human persecution.
Bibliography. Ali & Ripley (1972, 1987b), Beaman & Madge (1998), Blinov & Kryukov (1992), Blinov *et al.* (1993), Cook (1975), Coombs (1978), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Goodman & Meininger (1989), Goodwin (1986), Grimmett *et al.* (1998), Haffer (1993h), Hagemeijer & Blair (1997), Kryukov & Blinov (1994), Madge (2000), Madge & Burn (1994), Meise (1928), Melde (2004), Nakamura & Murayama (2004), Rasmussen & Anderton (2005b), Roselaar (1995), Saino & Scatizzi (1991), Sangster *et al.* (1997), Shirihai (1996), Stepanyan (1990, 2003), Vaurie (1954, 1959).

108. Large-billed Crow

Corvus macrorhynchos

French: Corbeau à gros bec **German**: Dschungelkrähe **Spanish**: Cuervo Picudo
Other common names: Jungle/Thick-billed/Black Crow; Japanese Crow (*japonensis*, *connectens*, *osai*); Eastern Jungle Crow (*levaillantii*); Indian Jungle Crow (*culminatus*)

Taxonomy. *Corvus Macrorhynchos* Wagler, 1827, Java.
Taxonomy confusing owing to large number of races covering wide geographical area. Formerly included in *C. coronoides*, and listed as *C. levaillantii* in some older literature. Races probably represent several different species. In Indian Subcontinent, small race *culminatus* meets larger Himalayan *intermedius*; the two differ both vocally and in some behavioural aspects, but it is uncertain where the species limits are in relation to the lowland Bengal race *levaillantii*. In a recent study, four species tentatively proposed: "*C. japonensis*" (with races *mandshuricus*, *connectens*, *osai*, *tibetosinensis* and *intermedius*), "*C. levaillantii*" (with *culminatus* and *colonorum*), "*C. macrorhynchos*" and "*C. philippinus*". Subsequent study, however, has indicated that *osai* and *connectens* are not closely related to N Japanese forms, and, indeed, *japonensis* and *mandshuricus* behave as two species on the island of Sakhalin, with no mixed pairs found in overlap zone (C Sakhalin). These factors suggest that as many as seven species may be a reasonable assessment of the complex, but more research is required, not only through genetic and vocal comparisons, but also involving investigation of their parasitic lice (Mallophaga) and whether differences between races is gradual or abrupt. Race *intermedius* intergrades with *tibetosinensis*. Other proposed races are *hondoensis* and *borealis* (subsumed in *japonensis*), *andamanensis* (in *levaillantii*), *anthracinus* (in *culminatus*), *hassi*, *mengtszensis* and *hainanus* (in *colonorum*) and *timoriensis* (in nominate). With such a complicated species, however, one or two of these, especially *anthracinus* of Sri Lanka and *andamanensis* of the Andamans, could well be resurrected following a comprehensive review. Eleven subspecies currently recognized.
Subspecies and Distribution.
C. m. intermedius Adams, 1859 – E Afghanistan and W & N Pakistan E along Himalayas to S Xizang and N Nepal.
C. m. culminatus Sykes, 1832 – peninsular India, SW Nepal and Sri Lanka.
C. m. levaillantii Lesson, 1831 – SE Nepal, Bangladesh, NE India, Andaman Is, Myanmar and Thailand E to C & S Indochina and S to N Malay Peninsula.
C. m. macrorhynchos Wagler, 1827 – C & S Malay Peninsula and Sundas E to Wetar and Timor.
C. m. philippinus (Bonaparte, 1853) – Philippine Is.
C. m. tibetosinensis O. Kleinschmidt & Weigold, 1922 – E & SE Tibetan Plateau and E Himalayas (E from Bhutan) E to N & NE Myanmar and extreme S China (S Qinghai S to Yunnan).
C. m. mandshuricus Buturlin, 1913 – N & C Sakhalin I, Russian Far East, Korea and NE China; breeding also recorded in Transbaikalia.
C. m. japonensis Bonaparte, 1850 – S Sakhalin I, Kuril Is and Japan (S to Kyushu and Osumi Is).
C. m. connectens Stresemann, 1916 – Amami Oshima and Ryukyu Is (Japan).
C. m. osai Ogawa, 1905 – S Ryukyu Is.
C. m. colonorum Swinhoe, 1864 – C & S China, Taiwan, Hainan I and N Indochina.



Descriptive notes. 46–59 cm; 450–1000 g. A medium-sized to large crow, varying much in size, with relatively long, dagger-like bill with somewhat arching culmen (most marked in males of the N races), base of culmen concealed by overlapping bristles. Nominate race has distinctly peaked forehead, plumage entirely black, head, neck and upperparts, including wing and tail, strongly glossed, upper surface of wing and central tail feathers shot with purple; underparts black with strong sheen; bases of neck feathers pale grey, throat feathers with notched hackles (giving somewhat jowled appearance); iris dark brown; bill (60–69 mm) and legs black. Distinguished from very similar *C. enca* by concealed culmen base, in flight by relatively longer tail with more graduated tip, wing with longer hand and more obviously fingered primaries. Sexes similar, female on average smaller than male, with less arched culmen and less strongly graduated tail. Juvenile has softer and less glossy plumage than adult, with matt black underparts, lacks throat hackles, has inside of mandibles reddish-pink (black in adult), iris smoky blue. Races differ in bill size, also in overall size and degree of gloss in plumage: *japonensis* is largest, has largest bill (70–80 mm) with almost ridged arch on culmen, dusky-grey bases of neck feathers and highly glossed plumage; *connectens* is similar to last but smaller (bill 62–69 mm); *osai* also is similar but bill smaller (55–59 mm); *mandshuricus* is only a little smaller than *japonensis*, has duller plumage, bill shorter (60–68 mm) but deeper and more highly ridged; *colonorum* is similar to *japonensis* but smaller (bill 57–61 mm), with duller neck and underparts, less purple in gloss of wings and tail; *tibetosinensis* is large (bill 60–73 mm), very black and glossy, and has variable whitish to dark grey bases of neck feathers; *intermedius* is large (bill 54–73 mm), dull greyish-black in colour, with bill somewhat slimmer, and has whitish bases of neck feathers; *philippinus* is close to nominate race in plumage, but has whiter bases of neck feathers and relatively longer tail; *levaillantii* is wholly glossy black, with bases of neck feathers dusky grey, bill 61–69 mm, rather deeper than the next; *culminatus* is small and rather glossy black, with slimmer bill than other races (bill 52–67 mm). Voice. In need of comparative analysis. Complex, with degree of variation within vocabulary of each taxon. All have reasonably similar cawing note which varies in hoarseness, *intermedius* has loud, dry "kaaa-kaaa", stronger and lower in pitch than that of *culminatus*, some calls of *intermedius* are quite musical and include single weak croak which lacks deep croaking resonance of the "prruuk-prruuk" of *C. corax*. Tibetan race *tibetosinensis* has low-pitched and rather hoarse "keearrh-keearr". Philippine *philippensis* gives loud, guttural "weerrk-weerrk-weerrk", the notes deeper and more spaced in delivery than those of *C. enca*. Race *levaillantii* said to give distinctive nasal yapping, with duck-like quality, each note rising and falling suddenly, "nYArk, nYArk", while those on Andamans are said to utter calls which are more plaintive and less harsh than those of *culminatus*. Nominate race has relatively low-pitched and gruff caws, and also gives deep gargling rattle in flight. Race *japonensis* patrolling territory utters "kroo-kroo" or "krau-krau". As is evident, it is difficult to decide on precise vocal differences between taxa on basis of transcriptions alone, especially when range of calls of each taxon not well known (e.g. the well-studied Indian *culminatus* is known to have at least ten distinct calls).
Habitat. Forests and woodland of all types across its wide range. In far N (in Amurland and on Sakhalin) chiefly by rivers and their floodplains in forests of the taiga, gathering by villages and settlements, particularly in winter. Reaches 2000 m in Sri Lanka, 2300 m in Nilgiris of S India and 4500 m in Sikkim. In Himalayas ranges to upper limits of tree-line and beyond, following yak (*Bos grunniens*) and pony caravans high into mountains; has reached 5000 m on Tibetan Plateau and been recorded following mountaineers on Everest as high as 6400 m. N populations forsake frozen interior in winter and congregate by river mouths and seashores. Farther S in Asia can often be found alongside the more numerous *C. splendens* in towns and cities; far less closely associated with man than is latter, but each little village with a large tree usually has a nesting pair of present species. Parties converge and flock to large trees, particularly those close to slaughterhouses, rubbish dumps and small fishing ports. In tropical Asia its habitats are similar to those in the far N, but may often be found in more or less semi-open agricultural land, with scattered trees. Favours forest edge and clearings, paddyfields and coconut (*Cocos nucifera*) plantations, especially by rivers and in coastal lowlands, including mangroves and wooded inshore islands. Where range overlaps with that of *C. enca*, latter seems unable to compete successfully with present species and becomes an inconspicuous crow of dense lowland forests.
Food and Feeding. Omnivorous scavenger. Takes carrion of all kinds, by foraging along shorelines and roadsides, stealing food items from vulture nests (food brought in by parent vultures to feed their young). Robs bird nests of both eggs and fledglings, feeds with vultures on animal carcasses, kills rodents and palm-squirrels (*Funambulus*), lizards (*Colotes*), frogs, large invertebrates including crabs, centipedes (Chilopoda), grasshoppers and locusts (Orthoptera), moths and caterpillars (Lepidoptera), beetles (Coleoptera), ants (Formicidae) and termites (Isoptera); clumsily hawks for winged termites and even small bats in flight. Also takes variety of fruit, both wild and cultivated, including berries and cherries; variety of cereals (e.g. *Sorghum*, *Oryza*, *Pennisetum*, *Triticum*, *Zea*), seen to wrench off whole maize cobs and digs up groundnuts (*Arachis*). Clumsily feeds among foliage of a variety of flowering trees (e.g. *Bombax*, *Erythrina*, *Butea*, *Grevillea*, *Spathodea*), taking both nectar and petals. In Japan, a bird feeding young was seen to hide food items during early-morning foraging, returning later to feed both young and sitting partner on nest. In N India one was watched as it hammered a concealed object, possibly a nut or a pine cone, with a stone. Usually encountered in pairs or family parties, often feeding with other birds in fruiting trees; larger congregations at good food sources. In Himalayas, follows herds of goats and sheep high into their summer pastures.
Breeding. Egg-laying begins at almost any time of year over such an extensive range. Eggs recorded late Apr in Amurland (*mandshuricus*), early May on Kuril Is and from late Apr on Hokkaido (*japonensis*), early Mar on Okinawa (*connectens*), Mar–Jun on Negros and Aug on Luzon (*philippinus*), Dec to early May in Peninsular Malaysia and Jan–Jun in Indochina (nominate), late Apr and May in Kashmir and Nepal (*intermedius*), Nov–Apr but chiefly Jan–Mar in Assam and Bangladesh (*levaillantii*), Mar–Apr in N India, and Apr–Sept but chiefly May–Jul in Sri Lanka (*culminatus*). Has long-term pair-bond. Solitary breeder. Nest built by both sexes, a platform of twigs and sticks, with deep cup lined with soft materials such as wool and hair, placed c. 7–10 m above ground in prominent tree fork, sometimes in crown of palm. Clutch 3–6 eggs (mean 4); incubation almost entirely by female, period 17–19 days (mean 18 days); chicks fed by both parents, leave nest at 3 or 4 weeks; family-members roost close to nest for c. 19 days after fledging, do not return to site once they have joined communal roost, but continue to keep together for up to 94 days after fledging. Nests parasitised by Common Koel (*Eudynamys scolopacea*).
Movements. Generally regarded as sedentary, but presumably wanders to a degree; sporadic observations on several islands of Japan, Indonesia and Philippines. In far N, Amurland, Kurils, Sakhalin and Hokkaido, many move out of the hostile interior in winter to coastal waters, particularly ice-free river mouths.
Status and Conservation. Not globally threatened. Widespread and quite numerous over most of its range. Few reports from Borneo, where rare; several specimens collected there in the past. Statements concerning its presence in NE Iran and extreme S Turkmenistan, and in Tajikistan and adjacent parts of N Afghanistan, almost certainly erroneous, as habitats there unsuitable (likely that such references are due to confusion with *C. corone* and/or *C. ruficollis* and *C. corax*). In Afghanistan it is confined to extreme E, where common in forest to N & E of Jalalabad. Over remainder of range it is a common and widespread species, which has benefited from man's forestry policies, opening up swathes and large clearings, providing open areas for foraging. In Malay Peninsula it has spread across the country with the opening-up of forests, having reached the hill stations of Cameron Highlands and Fraser's Hill in late 1940s and early 1950s, respectively; has also colonized Singapore over recent decades. As with *C. splendens*, evidence from India suggests that the amount of insects, particularly grasshoppers and locusts, that this corvid consumes outweighs the damage that it causes in fields of growing crops.
Bibliography. Ali (1949, 1962), Ali & Ripley (1972, 1987b), Austin & Kuroda (1953), Bates & Lowther (1952), Bishop (1992a), Bräunlich (2009), Brazil (1991), Buturlin (1915), Chasen (1939), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1976, 1987), Coates & Bishop (1997), Dementiev *et al.* (1954, 1970), Dickinson, Eck & Martens (2004), Dickinson, Kennedy & Parkes (1991), Fleming & Traylor (1964), Fleming *et al.* (1976), Goodwin (1986), Goroshko (2004), Grimmett & Inskipp (2003), Grimmett *et al.* (1998, 2000), Higuchi (1979), Kennedy *et al.* (2000), Kuroda (1976a, 1976b), Lamba (1963a, 1965), Londei (2002), MacKinnon & Phillipps (1993), Madge & Burn (1994), Martens & Eck (1995), Martens *et al.* (2000), McCarthy (2006), Meinertzhagen (1926), Meyer de Schauensee (1984), Nechaev (1991), Nuytemans (1998), Paludan (1959), Paynter (1961), Rand & Rabor (1960), Rasmussen & Anderton (2005a, 2005b), Roberts (1992), Robson (2000), Smythies & Cranbrook (1981), Stepanyan (2003), Tomek (2002), Vaurie (1958a), Wells (2007), White & Bruce (1986).

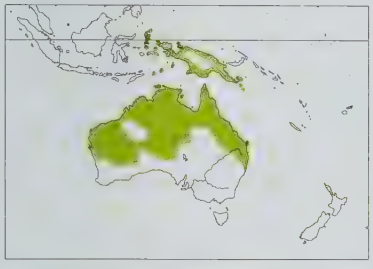

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109. Torresian Crow

Corvus orru

French: Corbeau de Torres **German**: Salvadorikrähe **Spanish**: Cuervo de Torres
Other common names: New Guinea/Papuan Crow (*orru*); Tanimbar Crow (*latirostris*); Australian Crow (*cecilae*)

Taxonomy. *Corvus orru* Bonaparte, 1850, Lobo, Triton Bay, New Guinea.
Until recently considered conspecific with *C. insularis*. Australian race *cecilae* formerly regarded as a separate species. Has been suggested that *latirostris* might not belong with present species. Other proposed races in Australia are *hartogi* (described from Dirk Hartog I, off Western Australia) and *probleema* (from Derby, in N Western Australia), both considered synonyms of *ceciliae*, and *queenslandicus* (from Dawson R, in Queensland), which possibly valid but further study required; described race *marngli* (from W Kimberley, in N Western Australia) based on misidentified *C. bennetti*. Three subspecies currently recognized.
Subspecies and Distribution.
C. o. orru Bonaparte, 1850 – Moluccas E to New Guinea, including D'Entrecasteaux Is and Louisiade Archipelago.
C. o. latirostris A. B. Meyer, 1884 – Babar and Tanimbar Is (E of Lesser Sundas).
C. o. cecilae Mathews, 1912 – W, C & N Australia, including major offshore islands.



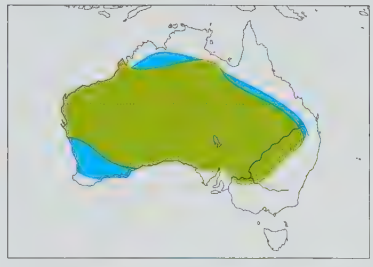
Descriptive notes. 48–53 cm; male 430–700 g, female 430–650 g. Medium-sized crow with rather stout bill, short throat hackles; compact, blunt-winged and short-tailed in flight. Nominate race is entirely glossy black, with white feather bases on head and neck; iris white, sometimes pale blue (in West Papuan Is and locally in N New Guinea); bill and legs black. Sexes similar. Juvenile is duller than adult, with pink gape, eyes blue-grey (fledgling) to brown; immature has eyes brown, becoming hazel. Race *latirostris* is similar to nominate, but slightly stouter bill, and eyes bluish-white (Tanimbar Is) or white (Babar); *cecilae* is like nominate, but slightly longer-winged and longer-tailed. Voice. Series of high-pitched (tenor), nasal, usually rapid and staccato caws, although utters some longer and harsher notes; typically 3–8 notes, sometimes with final 1–3 lower and slower, terminal note occasionally drawn out and descending, more honking than calls of *C. bennetti*. Also high-pitched yodelling caw, softer bubbling, croaking and long creaking calls, and single guttural notes.
Habitat. All terrestrial habitat types within range, from montane rainforest (1500 m) to littoral. Common in lightly wooded and open habitats, farmland, urban areas and other modified habitats. In Australian arid zone largely restricted to wooded watercourses.
Food and Feeding. Omnivorous predator and scavenger, strongly granivorous. Feeds mainly on invertebrates, small birds, eggs, nestlings, also carrion, including beachcast marine life; sometimes frogs and reptiles (lizards, turtle hatchlings), rarely fish. Also seeds, fruit, other plant material, occasionally nectar. Sometimes attacks weak or moribund lambs. Opportunistic, feeding mainly on the ground in open habitats, sometimes in trees and standing crops. Forages mainly by walking and gleaning from the ground or low vegetation, sometimes gleaning and snatching prey from foliage. Commonly patrols roads, sheep paddocks, rubbish dumps and human habitation for carrion and refuse. Sometimes dunks food in water before eating. Sometimes drops prey from height; robs raptors of prey. Avoids poisonous dorsal glands of cane toad (*Bufo marinus*) by turning carcass on its back and eating from belly. Caches or buries surplus food in such places as hole in cliff, or under soil, grass or leaves, later retrieving stored food. Forages in pairs and in small to large flocks.
Breeding. Recorded in all months in Australia, with eggs Aug–Jun in N and Jun–Dec in S of range; in New Guinea active nests Sept–Oct, eggs in Jan and Mar, and juveniles and large fledglings in Jan and early Apr; failed pairs renest. Monogamous. Solitarily breeder in well-dispersed pairs. Nest a bowl 38 cm wide and 19 cm deep, made from sticks, lined with plant fibres, wool, hair or cotton waste, built 3–45 m (usually more than 10 m) above ground in fork of tree or in artificial structure such as utility pole, tower or windmill platform. Clutch 1–7 eggs, usually 5; incubation by female, period 19–20 days; chicks fed by both sexes, nestling period 38–48 days (mean 41 days); young remain in natal territory for 2–3 months, or occasionally until following breeding season. Nests often parasitized by Channel-billed Cuckoo (*Scythrops novaehollandiae*). For 138 eggs in 30 clutches, hatching success 70% and fledging success 22%; other samples gave 77% hatching success from 43 eggs in ten nests, and 17 young from nine successful attempts out of 15 nests. First breeding when at least 2 years old (only white-eyed individuals recorded as breeding).
Movements. Resident. In humid areas juveniles, immatures and non-breeding adults form mobile, dispersive flocks of typically 20–150 individuals that congregate at large communal roosts; four such non-breeders (adult and immature, of indeterminate social status) used home ranges of up to 2250 ha (mean 700 ha). Some birds move between islands in Torres Strait.
Status and Conservation. Not globally threatened. Generally abundant and widespread; has increased in range and numbers with spread of agriculture and urbanization. Adult breeding pairs have large home range of c. 130 ha. In arid areas flocks tend to be both rare and small, numbering fewer than 20 birds. Roosts contain up to 1000 individuals. Benefits from artificial food sources, and is common in modified habitats. Perceived as a pest in sheep-rearing lands, orchards, crops, around poultry and in cities, and consequently is legally unprotected and is persecuted by shooting, trapping and poisoning in farmland (with little apparent effect on numbers). Well represented in protected areas.
Bibliography. Beehler *et al.* (1986), Bishop & Brickle (1999), Bradshaw & White (2006), Coates (1990), Coates & Bishop (1997), Coates & Peckover (2001), Debus (1982, 1996), Donato & Potts (2004b), Dutson *et al.* (2009), Everding & Jones (2005), Everding & Montgomerie (2000), Finch & McKean (1987), Higgins *et al.* (2006a), Jones & Lambley (1987), Lawrence (2005), Ley (1995), Madge & Burn (1994), Mees (1982), Morcombe (2000), Pizzey & Knight (1998), Rowley (1969a, 1970, 1973a, 1973b, 1973c, 1974), Rowley & Vestjens (1973), Rowley *et al.* (1973), Schodde & Mason (1999), Schodde & Tidemann (1986), Secomb (2005c), Simpson & Day (1996), Slater *et al.* (2003), Smith (1991), Storer & Eastwood (1991), White & Bruce (1986), Woodall (2004).

110. Little Crow

Corvus bennetti

French: Corbeau du désert **German**: Bennettkrähe **Spanish**: Cuervo de Bennett
Other common names: Bennett's/Small-billed Crow

Taxonomy. *Corvus bennetti* North, 1901, Moolah, western New South Wales, Australia.
Proposed race *bonhoti* (described from Murchison, in Western Australia) considered inadequately differentiated to warrant recognition; putative race *queenslandicus* (from Dawson R, in E Queensland), ascribed to present species, was based on misidentified *C. orru*. Monotypic.
Distribution. Inland and W Australia.



Descriptive notes. 45–48 cm; male 345–500 g, female 290–490 g, unsexed 282–525 g. Rather small and slender, short-legged crow with small bill, short throat hackles; compact, blunt-winged and agile in flight. Plumage is entirely glossy black, with white feather bases on head and neck; iris white; bill and legs black. Sexes similar. Juvenile is duller than adult, with pink gape, eyes blue-grey (fledgling) to brown; immature has eyes brown, becoming hazel. Voice. Series of rather deep (baritone), flat, hoarse, nasal and rapid caws (although notes slurred, rather than clipped), monotonous, of up to 15 notes, terminal note rarely prolonged; similar to voice of *C. mellori* but more nasal, and deeper and hoarser than that of *C. orru*. Also rapid, high-pitched caw of 3 notes, low bubbling and creaking calls, and single guttural notes.
Habitat. Most terrestrial habitat types in arid and semi-arid zones, but avoids dense tropical grassland. Commonly in low or open woodland, shrubland, pastoral land and towns. Wooded habitats typically dominated by eucalypts (*Eucalyptus*) and *Acacia*. Breeds only where surface water available.
Food and Feeding. Omnivorous predator and scavenger, strongly insectivorous. Feeds mainly on invertebrates, lizards, small birds, eggs, nestlings and carrion; occasionally frogs, small mammals; also seeds, fruit, other plant material, occasionally nectar. Occasionally attacks moribund lambs. Opportunistic, feeding mainly on the ground in open habitats, occasionally in trees and shrubs. Forages mainly by walking and gleaning from the ground or low vegetation, occasionally gleaning from foliage. Commonly patrols roads, sheep paddocks, rubbish dumps and human habitation for carrion and refuse. Sometimes dunks carrion in water before eating. Caching observed in captivity. Highly sociable, generally in large flocks.
Breeding. In S Australia laying mainly in late winter to spring, mostly mid-Jul to late Oct (peak late Aug and early Sept), occasionally to late summer (Feb), and sometimes in autumn (Mar–May), opportunistically after heavy rain; in N Australia lays Jan–Sept; failed pairs renest, and successful pairs sometimes attempt second brood. Monogamous. Nests colonially, as clumped pairs in small territories (0·5 ha) used only for breeding, or as more dispersed pairs where tree cover sparse. Nest a large bowl 30–36 cm wide and 23–37 cm deep, made from sticks, lined with bark, grass, feathers, wool, hair or pieces of cloth, often with clay layer beneath the lining, built 2–20 m (commonly less than 10 m) above ground in fork of tree or shrub or in artificial structure such as utility pole, tower or windmill platform. Clutch 1–8 eggs, usually 4–6; incubation by female, period 16–18 days; chicks fed by both sexes, nestling period 29–31 days; young remain in nest area for a few days, after which family departs from nest area with mobile flock. Nests occasionally parasitized by Channel-billed Cuckoo (*Scythrops novaehollandiae*). Breeding success during drought measured as 73% hatching success and 3% fledging success for 240 eggs in 56 clutches; other samples gave 43% hatching success and 20% fledging success from 79 eggs in 18 nests, 50% hatching success from 95 eggs in 22 nests, and 57% success in rearing young for 56 nests. Age at first breeding 3 years.
Movements. Apparently nomadic. Adult breeding pairs resident only for duration of breeding cycle; after breeding, apparently all birds (juveniles, immatures and adults) form mobile flocks of typically 50–300 birds, sometimes up to 500 or exceptionally thousands, that congregate at gluts of food and disperse or migrate up to 700 km. These movements take them to non-breeding areas outside the main breeding range, e.g. to far SW Australia. No evidence that adults return to traditional nesting territories, or that juveniles return to natal site to breed.
Status and Conservation. Not globally threatened. Abundant and widespread. Has increased in range and numbers with spread of agriculture and artificial water sources in rangelands; may have declined locally at S limit of range. Benefits from artificial food sources, and is common in modified habitats, although may be displaced by *C. mellori* in SE agricultural zone. Considered a pest in sheep-rearing lands, orchards, crops and around poultry, and consequently is legally unprotected and is occasionally shot, trapped or poisoned in farmland. Well represented in protected areas.
Bibliography. Debus (1982, 1996), Higgins *et al.* (2006a), Hobbs (1980), Klapste (1979), Lawrence (2005), Madge & Burn (1994), Morcombe (2000), Pizzey & Knight (1998), Rowley (1969a, 1970, 1973a, 1973b, 1973c, 1974, 2002a), Rowley & Vestjens (1973), Rowley *et al.* (1973), Schodde & Mason (1999), Schodde & Tidemann (1986), Simpson & Day (1996), Slater *et al.* (2003).

111. Australian Raven

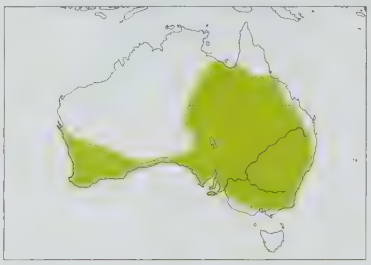
Corvus coronoides

French: Corbeau d'Australie **German**: Neuhollandkrähe **Spanish**: Cuervo Australiano

Taxonomy. *Corvus Coronoides* Vigors and Horsfield, 1827, Parramatta, New South Wales, Australia.
Much early confusion over correct specific name of this species; originally called *C. australis*, but identity and provenance of type specimen were suspect and the name was preoccupied; as a consequence, was named *C. marianae*, but that name is a synonym for the earlier *C. coronoides*, which takes priority. Purported taxon *difficilis* was based on an aberrant, immature specimen of present species and is invalid. Two subspecies recognized.

On following pages: 112. Little Raven (*Corvus mellori*); 113. Forest Raven (*Corvus tasmanicus*); 114. Collared Crow (*Corvus pectoralis*); 115. Hawaiian Crow (*Corvus hawaiiensis*); 116. Chihuahuan Raven (*Corvus cryptoleucus*); 117. Pied Crow (*Corvus albus*); 118. Ethiopian Raven (*Corvus edithae*); 119. Brown-necked Raven (*Corvus ruficollis*); 120. Common Raven (*Corvus corax*); 121. Fan-tailed Raven (*Corvus rhipidurus*); 122. White-necked Raven (*Corvus albicollis*); 123. Thick-billed Raven (*Corvus crassirostris*).

Subspecies and Distribution.
C. c. perplexus Mathews, 1912 – SW Australia.
C. c. coronoides Vigors & Horsfield, 1827 – E & SE Australia, including some major offshore islands (e.g. Kangaroo I, in South Australia).



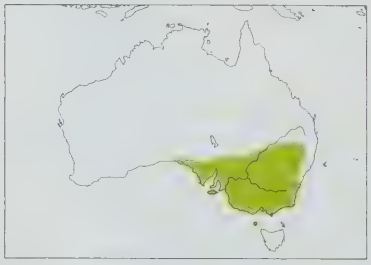
Descriptive notes. 48–54 cm; male 540–820 g, female 500–780 g. Large crow with stout bill, long, lanceolate throat hackles; tapered wings and rather long, slender tail in flight. Plumage is entirely glossy black, with grey feather bases on head and neck; iris white; bill black; extensive bare grey inter-ramal skin on side of chin; legs black. Sexes similar. Juvenile is duller than adult, with shorter hackles, pink gape and gular skin, eyes blue-grey (fledgling) to brown; older immature (in 2nd–3rd year) has eyes brown, becoming hazel. Race *perplexus* is slightly smaller than nominate, and has slightly shorter hackles. Voice. Utters series of high-pitched (tenor), slow and wailing caws (with throat hackles held prominently fanned), typically of 3 or 4 notes, terminal note drawn out and descending. Also gives shorter, sharper caws, sometimes antiphonally, low rattling and creaking note, and single long mournful notes.
Habitat. All terrestrial habitat types within range, from alpine (2000 m) to littoral and arid, but avoiding the most dense forest types such as rainforest. Most common in woodland, pastoral land and urban areas; often on edge between wooded and open areas. Habitats typically dominated by eucalypts (*Eucalyptus*), but occurs also in other vegetation types, including exotic pine (*Pinus*) plantations.
Food and Feeding. Omnivorous predator and scavenger; strongly carnivorous. Feeds mainly on invertebrates, small birds, eggs, nestlings, small mammals and carrion; occasionally frogs and lizards, rarely fish. Also seeds, some fruit, other plant material, occasionally nectar. Sometimes attacks weak or moribund lambs. Opportunistic, feeding mainly on the ground in open habitats, occasionally in trees. Forages mainly by walking and gleaning from the ground or low vegetation, occasionally snatching prey from foliage or in the air. Commonly patrols roads, sheep paddocks, rubbish dumps and parks for carrion and refuse. Often dunks carrion and household food scraps in water before eating. Caches or buries surplus food in terrestrial sites, such as under soil, bark or other debris, or in grass tussocks, later retrieving stored items. Forages singly, in pairs and in family parties; sometimes in small flocks in non-breeding season.
Breeding. Laying mainly in late winter to spring, mostly early Jul to late Oct (peak early Aug), but occasional breeding records in all other months (those from late summer and autumn referring to fledglings); failed pairs renest, but second attempt in a season rarely successful. Monogamous. Solitary, in well-dispersed pairs. Nest a large bowl 40 cm wide and 48 cm deep, made from sticks, lined with bark, grass, wool or hair, built 3–42 m (usually more than 10 m) above ground in fork of tree or on artificial structure such as utility pole, tower or windmill platform. Clutch 1–6 eggs, usually 4 or 5; incubated by female, period 19–21 days (mean 20 days); chicks fed by both sexes, nestling period 40–45 days (mean 43 days); young dependent on parents for a further three months. Nest occasionally parasitized by Channel-billed Cuckoo (*Scythrops novaehollandiae*). Breeding success measured as 73% hatching success and 35% fledging success for 1144 eggs in 260 clutches; 28% of clutches failed, giving 1–4 (mean 1·5) fledglings per successful pair, and 0·9–1·8 fledglings per pair per year. Age at first breeding 3 years.
Movements. Adult breeding pairs sedentary; occasionally short-range excursions of up to 5 km beyond territories to local gluts of food. Juveniles, immatures and non-breeding adults form mobile flocks of typically 10–30 birds that disperse up to hundreds of kilometres, though usually less than 150 km from natal site.
Status and Conservation. Not globally threatened. Abundant and widespread. Pair lives in large home range of c. 120 ha. Has increased in range and numbers with spread of agriculture, artificial water sources in rangelands, and urbanization. Benefits from artificial food sources, and is common in modified habitats. Considered a pest species in sheep-rearing lands, orchards, around poultry and in cities, and consequently is legally unprotected and is persecuted by shooting, trapping and poisoning in farmland (with little apparent effect on numbers). Well represented in protected areas.
Bibliography. Debus (1982, 1996), Higgins *et al.* (2006a), Kotler *et al.* (1998), Lawrence (2005), Lepschi (1994), Madge & Burn (1994), Meinertzhagen (1926), Mitchell & Attwood (2000), Morcombe (2000), Pizzey & Knight (1998), Rogers & Rogers (1999), Rowley (1969a, 1970, 1973a, 1973b, 1973c, 1974), Rowley & Vestjens (1973), Rowley *et al.* (1973), Schodde & Mason (1999), Schodde & Tidemann (1986), Simpson & Day (1996), Slater *et al.* (2003).

112. Little Raven

Corvus mellori

French: Petit Corbeau **German**: Gesellschaftskrähe **Spanish**: Cuervo de Mellor

Taxonomy. *Corvus mariana mellori* Mathews, 1912, Angas Plains South Australia.
Originally described as a race of *C. coronoides* (then known as *C. marianae*), although validity was not widely accepted; recognized as a distinct species in 1967. Proposed race *halmaturinus* (from Kangaroo I, off South Australia) considered indistinguishable from birds in rest of species' range. Monotypic.
Distribution. SE Australia, including Kangaroo I (off South Australia) and King I (in Bass Strait).



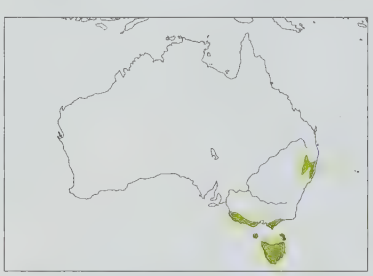
Descriptive notes. 48–50 cm; male 407–660 g, female 365–660 g. Medium-sized crow with rather slender bill, medium-length bifurcated throat hackles. Plumage is entirely glossy black, with grey feather bases on head and neck; iris white; bill and legs black. Sexes similar. Juvenile is duller than adult, with shorter hackles, pink gape, blue-grey (fledgling) to brown eyes; second-year has eyes brown, becoming hazel. Voice. Series of rather deep (baritone), usually rapid and clipped caws, typically of 7 notes (when perched, flicks closed wings upwards with each "bark"), deeper, harsher and more rapid than that of *C. coronoides*, although terminal note occasionally prolonged (and much shorter throat hackles less noticeable). Also various guttural caws and long creaky note.
Habitat. All terrestrial habitat types within range, from alpine (2000 m) to littoral and semi-arid, but avoids the most dense forest types such as rainforest. Most common in low or open woodland, pastoral land and urban areas; foraging flocks often in treeless grassland. Wooded habitats typically dominated by eucalypts (*Eucalyptus*), though occurs also in other vegetation types, including exotic trees.
Food and Feeding. Omnivorous predator and scavenger; strongly insectivorous. Feeds mainly on invertebrates, small birds, eggs, nestlings, small mammals and carrion; occasionally reptiles. Also seeds, some fruit, other plant material, occasionally nectar. Occasionally attacks moribund lambs. Opportunistic, feeding mainly on the ground in open habitats; also in trees. Forages mainly by walking and gleaning from the ground or low vegetation, or by snatching prey from foliage. Commonly patrols roads, sheep paddocks, rubbish dumps and parks for carrion and refuse. Sometimes dunks food scraps in water before eating. Caches surplus food in hiding places, such as under bark of tree; caching observed also in captivity. Forages mostly in small to large flocks.
Breeding. Laying mainly late winter to spring, mostly early Jul to mid-Nov (peak mid-Aug to early Oct), but can start as early as mid-May and (in alps) extend to early Dec; failed pairs renest, often successfully. Monogamous. Semi-colonial nester in clumped pairs in small territories (1–4 ha) used only for breeding, or as more dispersed pairs where tree cover sparse. Nest a large bowl of sticks, lined with bark, grass, feathers, wool, hair and/or human rubbish, built 1–55 m (commonly less than 10 m) above ground in fork of tree or shrub or on artificial structure such as utility pole, tower or windmill platform, rarely on ground or cliff. Clutch 1–6 eggs, usually 3–5; incubation by female, period 19–20 days; chicks fed by both sexes, nestling period 34–39 days (mean 37 days); young remain in nest area for a week, after which family departs from nest area with mobile flock; juveniles still fed by parents 1 month after leaving nest, but disperse up to 450 km within 2–3 months of fledging. Adults seen to feed fledgling Channel-billed Cuckoo (*Scythrops novaehollandiae*). Breeding success measured as 75% hatching success and 36% fledging success for 2250 eggs in 534 clutches, 32% of clutches failed, giving mean of 1·5 fledglings per nest; in another sample, of 298 nests, 49% produced fledglings. Age at first breeding 3 years.
Movements. Breeding pairs resident only for duration of breeding cycle, and commute daily to foraging areas up to 15 km away; form post-breeding flocks of up to 30 individuals, which roam within 20 km of nesting territories. Juveniles, immatures and non-breeding adults form mobile flocks of typically 30 or more individuals, sometimes 200–300 birds, which disperse or migrate up to 450 km; some eventually return to natal site to breed.
Status and Conservation. Not globally threatened. Abundant and widespread; has increased in range and numbers with spread of agriculture and urbanization. Benefits from artificial food sources, and is common in modified habitats. Has perceived pest status in sheep-rearing lands, orchards, crops, around poultry and in cities, and consequently is legally unprotected and is persecuted by shooting, trapping and poisoning in farmland (with little apparent effect on numbers). Well represented in protected areas.
Bibliography. Bochm (1977), Bolton (1984), Debus (1996), Fletcher (1988), Higgins *et al.* (2006a), Hubregtse (2005), Jurisevic (1999), Lawrence (2005), Lewis (1978), Madge & Burn (1994), McAllan (1995), McCulloch (1980), Morcombe (2000), Pizzey & Knight (1998), Rowley (1967, 1969a, 1970, 1973a, 1973b, 1973c, 1974), Rowley & Vestjens (1973), Rowley *et al.* (1973), Schodde & Mason (1999), Schodde & Tidemann (1986), Simpson & Day (1996), Slater *et al.* (2003), Swinburne & Jessop (2005).

113. Forest Raven

Corvus tasmanicus

French: Corbeau de Tasmanie **German**: Tasmankrähe **Spanish**: Cuervo de Tasmania
Other common names: New England/Relict Raven

Taxonomy. *Corvus marianae tasmanicus* Mathews, 1912, Tasmania.
Formerly considered a race of *C. coronoides*. Has been suggested that race *boreus* (sometimes referred to erroneously as *novaanglica*) merits treatment as a full species, though without supporting evidence; recent studies of vocalizations indicate that current treatment is appropriate. Two subspecies recognized.
Subspecies and Distribution.
C. t. boreus I. Rowley, 1970 – NE New South Wales, in E Australia.
C. t. tasmanicus Mathews, 1912 – coast of extreme SE Australia, islands in Bass Strait and Tasmania.



Descriptive notes. 52–54 cm; male 500–800 g and female 535–755 g (nominate), male 550–740 g and female 600–710 g (*boreus*). Large, long-legged crow with stout bill, medium-length bifurcated throat hackles, blunt wings and short tail. Plumage is entirely glossy black, with grey feather bases on head and neck; iris white; bill and legs black. Sexes similar. Juvenile is duller than adult, with shorter hackles, pink gape and gular skin, blue-grey (fledgling) to brown eyes; older immature (in 2nd–3rd year) has eyes brown, becoming hazel. Race *boreus* is like nominate in plumage, but has longer wings and tail, proportions thus more as those of *C. coronoides* (but in flight has rounded, broad-based wings and broad tail). Voice. Series of deep (bass), slow and guttural caws, given with throat hackles noticeably fanned and tail deeply depressed, typically of 4 notes, with terminal note drawn out and descending. Also gives shorter, sharper barks, sometimes antiphonally, and guttural croaking notes. Calls deeper and harsher than those of *C. coronoides*; richer and often more leisurely than calls of *C. mellori*.
Habitat. All terrestrial habitat types within range, from subalpine (1500 m) to littoral, including dense forest, though rarely within or below rainforest canopy. Most common in woodland and pastoral land; often on edge between wooded and open areas. Habitats typically dominated by eucalypts (*Eucalyptus*), but occurs also in other vegetation types, including exotic pine (*Pinus*) plantations.
Food and Feeding. Omnivorous predator and scavenger; strongly carnivorous. Feeds mainly on invertebrates, small birds, eggs, nestlings, small mammals and carrion, including beachcast marine life; occasionally lizards. Also seeds, some fruit, other plant material, occasionally nectar. Sometimes attacks weak or moribund lambs. Opportunistic, feeding mainly on the ground in open habitats, sometimes in trees and shrubs. Forages mainly by walking and gleaning from the ground or low vegetation, sometimes gleaning or snatching prey in foliage; occasionally wades in shallow water. Commonly patrols roads, sheep paddocks, rubbish dumps and parks for carrion and refuse. Sometimes dunks food in water before eating. Caches or buries surplus food in terrestrial sites, such as under soil or grass or in grass tussocks, and especially in arboreal hiding places, such as

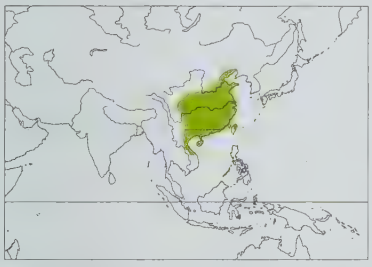
crevices in trees, behind loose bark, or under leaves placed in purpose-built stick platform; retrieves stored food later. Forages in pairs and family parties; also in larger flocks of non-breeders.
Breeding. Laying mainly late winter to spring, mostly Jul–Sept, but extending to early summer (mid-Dec) in Tasmania. Monogamous. Solitary nester, in well-dispersed pairs. Nest a large bowl c. 40 cm wide and 50 cm deep, made with sticks, lined with bark, leaves, feathers, grass, wool, fur, seaweed and/or horse manure, built 3–36 m (usually more than 10 m) above ground in fork of tree; on offshore islands sometimes on or near ground or on rock ledge. Clutch 3–6 eggs, usually 4 or 5; incubation by female, period probably c. 20 days; chicks fed by both sexes, nestling period 37–43 days; young remain dependent for a further three months. Nests occasionally parasitized by Channel-billed Cuckoo (*Scythrops novaehollandiae*). Broods of three fledglings common; one pair raised 11 young over six years, giving average of 1·8 young per attempt. Age at first breeding 3 years.
Movements. Breeding pairs sedentary within large home range. Juveniles, immatures and non-breeding adults form mobile, dispersive flocks of typically 10–30 individuals, sometimes congregating in flocks of up to 100 or more at gluts of food. Commonly makes sea crossings of 10–30 km between islands. Many individuals apparently remain within 100 km of natal site, although groups readily cross Bass Strait between Tasmania and mainland Australia, involving sea crossings of up to 90 km.
Status and Conservation. Not globally threatened. Abundant and widespread in Tasmania. Populations in coastal SE mainland Australia small and fragmented. N race *boreus* considered "Near-threatened" nationally on account of small, fragmented and declining populations, which are subject to habitat loss and to competition from expanding populations of *C. coronoides* and *C. orru*. In Tasmania, has probably increased in numbers with spread of agriculture and urbanization; lives in home range of c. 100 ha in pastoral areas, to 300–400 ha in coastal forest. Benefits from artificial food sources, and is common in modified habitats. Has perceived pest status in sheep-rearing lands, orchards, crops and around poultry, and consequently is legally unprotected and is persecuted by shooting, trapping and poisoning in farmland (with little apparent effect on numbers). Well represented in protected areas.
Bibliography. Debus (1982, 1984, 1996), Debus & Rose (2006), Fell (1987), Fitzsimons (2003), Higgins *et al.* (2006a), Kloot (1980), Lawrence (2005), Madge & Burn (1994), McCulloch & Thompson (1987), Morcombe (2000), Pizzey & Knight (1998), Rowley (1969a, 1970, 1973a, 1973b, 1973c, 1974), Rowley & Vestjens (1973), Rowley *et al.* (1973), Schodde & Mason (1999), Schodde & Tidemann (1986), Secomb (1997, 2005a, 2005b), Simpson & Day (1996), Slater *et al.* (2003).

114. **Collared Crow**

Corvus pectoralis

French: Corbeau à collier **German**: Halsbandkrähe **Spanish**: Cuervo Acollarado
Other common names: White-necked Crow(!)

Taxonomy. *Corvus pectoralis* Gould, 1836, China.
Formerly known as *C. torquatus*, but that name invalid, as preoccupied. Possibly part of the superspecies formed by *C. corone* and *C. cornix*. Monotypic.
Distribution. Lowland C, E & SE China from S Gansu and Shaanxi E to Liaoning, Hebei and Shandong, S to Sichuan, Yunnan, Hainan I, Guangdong and Fujian, Taiwan (including small island of Kinmen, off Fujian), and Vietnam (lowland E Tonkin S to C Annam).



Descriptive notes. 50–55 cm; 347–512 g. A distinctive pied crow with pointed throat feathers; structurally similar to *C. corone*, but slightly larger size, relatively longer wing and tail, more prominently fingered primaries, and usually slightly slimmer bill (impression created by somewhat straighter culmen). Most of plumage is black, glossed purplish, bluish and greenish, with starkly contrasting wide white collar which extends over nape, upper mantle and side of neck and across lower breast (white feathers have grey bases); iris dark brown; bill and legs black. Sexes similar. Juvenile has looser, softer plumage with white areas washed grey, probably also has paler and greyer iris and pinkish-red interior of mandibles, but clarification needed. Voice. Typical call a rolling, hoarse "kaaarr", also repeated less forcefully as "kaar-kaar". Reported as uttering variety of cawing, clicking and creaking sounds, but calls generally higher in pitch than those of congeners, especially *C. macrorhynchos*.
Habitat. Inhabits very low-lying agricultural land, occasionally on higher ground. Riverine plains with scattered trees and extensive rice paddies favoured; found also in lightly wooded country near water or marshes, but avoids more heavily wooded or hilly country inhabited by *C. macrorhynchos*. Less frequently in parks or gardens, or in towns.
Food and Feeding. Omnivorous, but far less of a scavenger than either *C. corone* or *C. macrorhynchos*. Diet in need of study; consists chiefly of invertebrates (mainly insects and their larvae), small crustaceans and molluscs, with a certain amount of grain, including rice; some edible refuse taken, but little in the way of carrion. Feeds almost entirely on ground, foraging along canal banks and in shallow water at edges of marshes, pools, rice paddies and riversides. In captivity, dunks messy food items in water, afterwards holding the item under the foot and breaking it into pieces; presumed to do so also in the wild. Rather solitary by nature, generally met with in pairs or family parties; may sometimes associate with *C. dauuricus* and *C. macrorhynchos*.
Breeding. Season commences in early Feb in S China, young fledging at end Mar. Presumed to have monogamous long-term pair-bond. Solitary nester. Rather large nest based on sticks and twigs, with lining of soft plant materials and animal fur, constructed within crown of large tree. Clutch 2–6 eggs, average 4; no information on incubation and nestling periods.
Movements. Resident in S portions of range; many in N (and probably W) withdraw S to milder coastal areas of S China in winter. Unusual during any season further N than Beijing, but vagrants have been reported N to SW Heilongjiang and on Taiwan.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Surprisingly poorly studied for so widespread a species. Uncommon; decreasing. Was thought to be relatively numerous over much of SE China, but has recently suffered a decrease in its population and a contraction in its range. Now present regularly at rather few sites; two localities in Hong Kong (Plover Cove and Deep Bay areas) appear to be important strongholds. Now very rare in Taiwan, where possibly no longer breeds; numbers on Kinmen I drastically reduced, from flocks of hundreds in 1990s to single-figure groups. Status in Vietnam requires investigation; only three recent records, and possibly no longer breeds there. Reduction in numbers, at least in China, believed due to loss of food supplies owing to agricultural intensification and consequent over-use of pesticides; in some areas this exacerbated by human persecution. As the decline appears to be continuing, the conservation status of this species requires careful monitoring.
Bibliography. Anon. (2008p), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1976), Goodwin (1986), Lei Jinyu & Liu Yang (2006), Liu Yang & Lei Jinyu (2005), MacKinnon & Phillipps (2000), Madge & Burn (1994), Meyer de Schauensee (1984), Nguyên Cu *et al.* (2000), Robson (2000), Vaurie (1959), Wildash (1968).

115. **Hawaiian Crow**

Corvus hawaiiensis

French: Corneille d'Hawaï **German**: Hawaiikrähe **Spanish**: Cuervo Hawaiano
Other common names: 'Alala

Taxonomy. *Corvus hawaiiensis* Peale, 1848, a few miles inland from village of Kaawaloa, Hawaii.
In earlier literature often referred to erroneously as *C. tropicus*. Preliminary genetic analysis suggests that this species may be more closely related to *C. corax* than to other crows, a conclusion supported by morphological features (including large size, especially of bill) and vocalizations. Monotypic.
Distribution. Formerly occurred on Hawaii (and probably Maui), in Hawaiian Is.



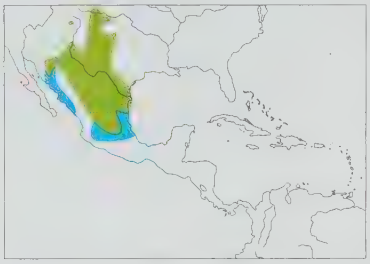
Descriptive notes. 48–52 cm; male average 555 g, female 485 g (released captive-reared birds). A medium-sized crow with a relatively large head, long legs, squarish tail and stout, moderately arched bill; conspicuous nasal tuft covering base of culmen; fine bristle-like throat feathers. Plumage is dull, unglossed black, body feathers with dull grey bases, wing dull dark brown (primaries with brown outer webs); iris dark brown; bill and legs black. Sexes similar, males 3–9% larger than female in all measurements. Juvenile has plumage rather fluffy, dull dark plumbeous-grey; iris blue, lining of mouth pink. Voice. Loud, rich repertoire of graded calls poorly understood. Male apparently more vocal than female, especially in giving loud "aa-wooop" calls for long-distance territory defence; neighbouring males duel vocally, often matching each other's loud screams, whoops, howls, and yells for over 20 minutes. Loud "caw", "whaaa", "all-woo" and "aa-waaooop" used also for advertising location of territory and group-members. Aggression often punctuated with shrieks, quick barks, and growls; when threatened, high pitched "caw" or shriek often ends with growl. High-pitched "raa-raa" series as contact call among family-members. Nest defended with loud, raucous series of "caw-caw-caw". Begging call of female and dependent young "whaaa-whaaa-whaaa". Male gives low-pitched "owww-owww-owww" growl ending in "aaow-woop" or shriek prior to copulation, while female gives begging call. Soft "arraagh-aaraagh" or "rraack-rraack" between mates. Increasingly intense, ascending series of "caw-caw" when mobbing predators and intruding crows. Descending "raak-raaak-raaaak" when pursued.
Habitat. Inhabited heterogeneous wet and dry forests frequently affected by volcanic eruption. Forests characterized by 'ohi'a (*Metosideros polymorpha*), mamane (*Sophora chysophylla*), naio (*Myoporum sandwicense*) and koa (*Acacia koa*) trees; tree-ferns and a diversity of tropical shrubs and vines fill in the thick lush forests and provide important foods.
Food and Feeding. Omnivorous. Wide variety of fruits, nuts and invertebrates; eggs and nestlings of other birds; flower nectar. Isopods, spiders (Araneae) and many other invertebrates comprise bulk of diet, followed by fruits and other plant parts. Pilo (*Coprosma rhynchocarpa*), 'ie'ie (*Freycinetia arborea*) and ho'awa (*Pittosporum*), 'olapa (*Cheirodendron trigynum*), 'oha kepau (*Clermontia*), mamaki (*Pipterus albidus*), 'akala (*Rubus hawaiiensis*), manono (*Hedyotis*), pukiawe (*Styphelia tameiameiae*), 'aiea (*Nothocestrum*) and 'ohelo (*Vaccinium calycinum*) provide important native berries and nuts; introduced guava (*Psidium cattleianum* and *Psidium guajava*) and Christmas berry (*Schinus terebinthifolius*) may provide food at lower elevations. Nestling diet becomes especially rich in protein, e.g. birds, eggs, mice (Muridae) and invertebrates, as young develop; food brought to nestlings appears out of proportion to availability (adults eat native foods primarily in proportion to availability). Forages in trees, shrubs, and native vines such as *Freycinetia arborea*, and occasionally on the ground. Probes flowers for nectar; uses tree crotches as anvils on which it hammers hard nuts to open them, but not known to drop nuts to facilitate opening.
Breeding. Nest-building early Mar to early Jun. Large stick nest (stick diameter 2–12 mm), lined with moss, grass, rootlets and other fine material, external diameter 45 cm, height 24 cm, internal diameter 19–20 cm, depth 7 cm, built in tree; territory-owners exclude other breeders from area within 1–4 km of nest-site. Clutch 1–5 eggs, usually 3; incubation by female, period 20 days; chicks brooded by female, fed by both parents, nestling period 6 weeks; young fly poorly for several days to 2 weeks after fledging, increasing vulnerability to introduced mammalian predators. Annual productivity low, 1·1–1·4 fledglings per successful nest. Adult survival high; a wild female lived for 18 years and a captive male for 25 years.
Movements. Resident. In the past, moved to higher elevation after nesting when *Freycinetia arborea* fruit became scarce at low levels; dispersal of up to 6·8 km observed.
Status and Conservation. EXTINCT IN THE WILD. Restricted-range species: present in Hawai'i EBA. Formerly occurred on Hawaii (and probably on Maui). Last wild population occupied less than 20 km² of forest on W slope of Mauna Loa (1000–1890 m), on Hawaii; last wild individual seen in summer of 2002. Captive population exists, in 2006 consisting of 38 individuals at the Keauhou Bird Conservation Centre (Hawaii) and 15 at the Maui Bird Conservation Centre; 28 of these are used in a captive-breeding programme. The extinction of this species in the wild resulted from a combination of factors. Activities of early human settlers (Polynesian) several hundred years ago may have eliminated crow species on Maui (*C. viriosus*, *C. impluviatus*, and perhaps present species). More recently, eliminated from the island of Hawaii, the causes including: introduction of mosquitoes (Culicidae), disease (including malaria, pox virus, and toxoplasmosis), predators and competitors including rats (*Rattus*), mongoose (*Herpestes*), feral cats and alien birds; degradation of habitat leading to loss of native foodplants and increased grass and open forest, which favours the native Hawaiian Hawk (*Buteo solitarius*), a predator of present species; and shooting and trapping by people. Efforts in late 1990s (27 juveniles reared and released during 1993–1999) to augment the declining wild population were halted after predation on released crows by wild hawks increased; 21 of the released birds died from predation or disease. Techniques to breed, rear and release this species are established and validated, but future releases are pending further growth of the captive population and the management of limiting factors in the wild. Listing of this species as "endangered" in the USA has provided for recovery planning and significant financial investment in captive propagation, habitat acquisition, and management.
Bibliography. Anon. (2003d, 2008p), Banko *et al.* (2002), Butchart & Stattersfield (2004), Duckworth, Cade *et al.* (1992), Fleischer & McIntosh (2001), Fleischer *et al.* (1998), Griffin *et al.* (1987), Kuehler *et al.* (1995), Marzluff & Angell (2005), Meinertzhagen (1926), Pratt *et al.* (1987), Sakai *et al.* (1986), Stattersfield & Capper (2000).

116. Chihuahuan Raven

Corvus cryptoleucus

French: Corbeau à cou blanc **German**: Weißhalsrabe **Spanish**: Cuervo Llanero
Other common names: White-necked Raven(!), American White-necked Raven

Taxonomy. *Corvus cryptoleucus* Couch, 1854, Charco Escondido, Tamaulipas, Mexico.
Multiple analyses of mitochrondrial DNA suggest that present species is sister to the "California clade" of *C. corax*, these taxa differing by only 1·75% (all mitochondrial DNA) to 1·8% (cytochrome *b* only), indicating that they diverged between 1·1 and 0·6 million years ago (well after the two clades of *C. corax* diverged); this suggests that ancestor of present species may have been *C. corax* of "California clade" that became isolated in SW North America c. 1 million years ago. Monotypic.
Distribution. Breeds in SW USA in SE Colorado and from SE Arizona, S & E New Mexico, S Nebraska and S Kansas S to W Oklahoma and W & S Texas and in N Mexico S to NW & NC Sonora, NE Jalisco, Guanajuato, NW Hidalgo, Neuvo León and C Tamaulipas. Winters throughout breeding range and also in NW & C Mexico (NW coast, and Guadalajara and Michoacán).



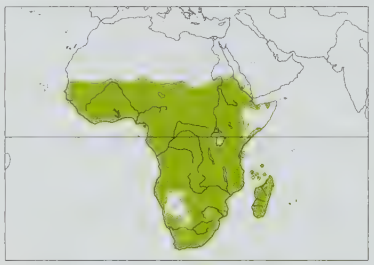
Descriptive notes. 46–53 cm; 380–670 g. A moderately sized raven intermediate in many respects between *C. corax* and *C. brachyrhynchos*, with long wings, graduated pointed tail (appearing somewhat wedge-shaped in flight), large stout bill with extensive nasal bristles covering more than half of exposed culmen, long and lanceolate throat feathers. Plumage is black, with violet to purplish sheen dorsally, gloss appearing more bluish on underparts; downy basal parts of neck and breast feathers white (exposed by strong wind or during social display); iris dark brown; bill and legs black. Differs from *C. corax* in smaller size, white (not grey) bases of neck feathers, more extensive nasal bristles, and, in flight, more rounded (less wedge-shaped) tail. Sexes similar, male slightly larger than female. Juvenile is duller than adult, with slight metallic blue-green sheen, grey to dull white bases of neck and breast feathers, no lanceolate throat plumes; first-year like adult, but retained wing and tail generally dull (and often fade to brown), second-year like adult; base of bill gradually turns from yellowish to black during first year and mouth from red to black during first two years. Voice. Not well studied. Primary call a loud, harsh "kr-a-a-a-a", higher-pitched than "quork" of *C. corax* and lower-pitched and more guttural that "caw" of *C. brachyrhynchos*, given singly or in series with varying intensity (perhaps to indicate caller motivation); used both for contact and for scolding (no distinction noted). Other soft and varied calls include "ug-ug" during sexual displays, high-pitched food-begging calls of juveniles and perhaps females, faint "chirr" accompanying submissive display, and weird sounds during roost formation.
Habitat. In N of range, found in short-grass prairie where power poles, windmills and buildings provide nest-sites. In C & S portions of range, typically in desert grassland where shrubs and small trees, e.g. mesquite (*Prosopis*), acacia (*Acacia*) and yucca (*Yucca*), form islands among a sea of perennial grasses, mesquite–shinnery oak (*Prosopis–Quercus harvardii*) or creosote bush (*Larrea tridentata*) shrublands, dry desert grasslands, rolling hills at lower reaches of pinyon–juniper (*Pinus–Juniperus*) woodland, and edges of low-elevation riparian woodlands. Sea-level to 2400 m. In non-breeding season, congregates in agricultural fields and refuse dumps near towns.
Food and Feeding. Omnivore. Diet consists primarily of large insects, especially grasshoppers (Orthoptera), beetles (Coleoptera), Lepidoptera and bugs (Hemiptera), and small mammals, especially carrion of rabbits (*Sylvilagus* and *Lepus*); also eats variety of soft-kerneled grains (mostly sorghum and maize, during autumn and winter), native fruits, e.g. *Opuntia*, *Condalia* and *Celtis*, and cultivated nuts, e.g. pecan (*Carya illinoensis*); occasionally preys on bird eggs, nestlings and fledglings, including those of large species such as Wild Turkey (*Meleagris gallopavo*), and on reptiles, amphibians and fish. Nestling diet protein-rich, of insects and small animals. Often forages in flocks; non-breeders, and perhaps some foraging breeders, may form flocks of 50–200 individuals and forage over many square kilometres. Flock-members walk, hop and fly in loose, wave-like fronts. Chases insects and small animals, probes ground, turns over cow dung, follows ploughs, and patrols roadways in search of live prey and carrion; takes cues from other birds and people to find agricultural and other anthropogenic food bonanzas. Caches surplus food; social lifestyle, association with humans, and reliance on ephemeral and varied foods have likely favoured development of spatial and non-spatial memory, use of insight, and cultural inheritance; not studied in detail, but observations and laboratory tests indicate that this corvid remembers its cache locations and can rapidly learn to discriminate among numerical and non-numerical cues. Use of communal roosts increases throughout late summer and early autumn, commutes from roosts to concentrations of food, travelling up to 40 km or more from roosts at this time; in late autumn (Nov) and throughout winter, continues to forage widely in large flocks.
Breeding. Nest-building Apr in N of range, earlier in Mexico, laying mid-Apr (typically May) to late Jun. Nests slightly aggregated, often in clumps of 3–5 with inter-nest distance 200–1400 m, but can be more than 8 km apart; spacing may reflect variation in occurrence of suitable nesting sites or social constraints. Pair appears to defend area within 100 m of nests from conspecifics and forages to at least 10 km from nest. Bulky nest 31–61 cm in diameter and 36 cm deep, consisting of loose outer platform of interwoven thorny twigs (often mesquite) and soft inner cup (15–21 cm diameter, 13–15 cm deep) of mammal hair, shredded tree bark, yucca fibres, dry grass, feathers and moss, variety of artificial substances incorporated into cup (including wool, cotton, paper, burlap, twine and rope, rags, hog bristles) and outer platform (may be nearly entirely of wire); placed 1·5–20 m (usually 2–4 m) above ground in tree (often mesquite, but many others used), or on artificial structure such as pole, windmill, building, tower, oilfield machinery; typically in taller tree and surrounded by taller shrubs than expected from random placement. Clutch 1–8 eggs, usually 4–6; incubation by female, male assisting to some degree, period 18–22 days; hatching asynchronous, chicks brooded for several days, shaded as needed, nestling period 37–40 days; post-fledging care poorly known, 5–20 days or longer. Breeding success varies annually, greatest after wet springs when grasshoppers abundant. Oldest recorded individual was 12·5 years.
Movements. Relatively sedentary during breeding season. Dispersal poorly known, but early ringing studies in Texas (S USA) recovered 13 individuals within 40 km of natal area and one 72 km distant; some, if not most, adults appear to reoccupy breeding territory and likely maintain home range from year to year unless resources fail.
Status and Conservation. Not globally threatened. Status little known in Mexico; in USA, fairly common, and populations appear to be stable or slightly declining; exact breeding range imprecisely known because of confusion with *C. corax*. During 1966–1999, surveys in USA detected a non-significant annual decline of 1·72%. Range has gradually contracted, except in WC plains of USA, since extirpation of bison (*Bison bison*). Changing agricultural practices on plains of Colorado and Kansas may be affecting this decline in extreme NE of the range; locally, abundance and reproductive success vary annually, perhaps reflecting abundance of food, including insects and human subsidies. As it is a predator in a desert ecosystem, this corvid may be an important indicator of ecosystem function and a sentinel of change. May be vulnerable to variety of threats in the future. Human persecution has occurred in the past, and may reduce local populations perceived as agricultural pests or nuisances; this could become increasingly common if this species continues to expand into growing towns and cities. Droughts and new diseases are increasingly important. Loss of shinnery oak due to climatic, biotic or anthropogenic change may reduce orthopteran prey needed by ravens. Poisoning of rodents, reduction in jackrabbit numbers (directly or indirectly through habitat conversion) and use of insecticides will indirectly, and perhaps directly, reduce corvid abundance and productivity. West Nile Virus is an emerging disease along Rio Grande, and will likely reduce this species' populations in infected areas for at least several years. Because of its limited range and increasing threats facing it, this corvid could well become threatened in the future.
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117. Pied Crow

Corvus albus

French: Corbeau pie **German**: Schildrabe **Spanish**: Cuervo Pío
Other common names: African Pied Crow, White-bellied Crow

Taxonomy. *Corvus albus* Statius Müller, 1776, Senegal.
Forms a superspecies with *C. edithae* and *C. ruficollis*. Hybridizes frequently with former in NE of range; recent observations suggest that interbreeding is not immediate when the two meet, and that some time is required for breeding-cycle synchrony to develop. Despite extensive range of present species, little variation of any significance is apparent (birds in far N have somewhat larger bill than those in S), and no races have been described. Monotypic.
Distribution. Almost the whole of sub-Saharan Africa S from c. 17° N in Mauritania and Mali, C Chad and 20° N on Red Sea coast of Sudan (absent from extensive tracts of Eritrea, Ethiopia and Somalia, from the most arid regions of Namibia, W Botswana and Kalahari basin of NW South Africa, and from higher elevations of Lesotho); present on islands of Bioko (Fernando Póo), Zanzibar, Pemba and Mafia (off Tanzania), and Comoro Is, Aldabra, Glorieuses Is and Madagascar.



Descriptive notes. 45 cm; 400–700 g. Large corvid with tail of moderate length and distinctly graduated towards tip, throat feathers slightly elongated and mostly pointed. Has head, neck and upper chest black, glossed blue and purple, contrasting with white collar on upper mantle which broadens on underparts to extend over breast and foreflanks, and just onto axillaries; rest of upperparts (lower mantle to uppertail-coverts) and underparts (rear flanks, tibia and ventral area) dull, less glossy, black; upperwing and tail black, glossed with blue and purple; iris dark brown; bill and legs black. Sexes similar. Juvenile has black of head, wings and tail less glossed than adult, and feathers of head and undertail-coverts shorter and "looser", also demarcation between white and black areas of body less clear-cut owing to grey feather tips. Hybrids with *C. edithae* exhibit variety of grey shadings, or speckled breast and collar areas on body. Voice. Typical call a deep, guttural "kraaak", similar to those of both *C. frugilegus* and *C. corax*, varying in pitch, sometimes a deeper "rrawrr" or shorter, upslurred "krow" or rather flat "raa", the last often prolonged into almost cat-like "raaaaeow". Also gives dry double rattle, the first part of which often lower in pitch, "torrrrrrh-tarrrrrrh". Other calls include muffled nasal "klaang", hollow "klok-klok", throaty "glupp" and flat "ack-ack". Many of these calls very similar to those of *C. edithae* and may be accompanied by head-bobbing and tail movements.
Habitat. Open country, including grasslands, open woodlands, forest clearings, savanna, riverbanks and lakeshores. Freely about human habitation, foraging around farmsteads, villages and even towns and cities. Habitually visits rubbish dumps and slaughterhouses. Avoids dense forest, deserts and highly mountainous regions. From sea-level upwards, to 3700 m in Ethiopia, but most abundant at lower elevations.
Food and Feeding. Omnivorous. Takes all manner of invertebrates, including spiders (Araneae), ticks (Ixodoidea), beetles (Coleoptera), termites (Isoptera), grasshoppers and locusts (Orthoptera), and molluscs. Many small vertebrates also eaten, e.g. frogs, lizards, rodents, fish and small birds. Even capable of catching locusts, small birds and bats in flight, and reported as killing or injuring sickly newborn lambs. Familiar sight by roadside, where it patrols for kills; scavenges at rubbish bins and rubbish dumps, often with Black Kites (*Milvus migrans*) and Marabous (*Leptoptilos crumeniferus*). Recorded as favouring vegetable items in S of range, where it takes various seeds, roots and fruits; digs up sown grain, and breaks down maize plants by perching on them, then stripping kernels from cob when on ground. Other crop plants taken include oil palm nuts (*Elaeis guineensis*), cassava, dates, potatoes, rice and sorghum. Also eats fleshy part of coconuts and groundnuts. Raids birds nests, entering heronries to take nestlings and eggs; recorded as taking whole nest of a small bird in bill and flying away to enjoy its contents on a more convenient perch. Follows bush fires to take escaping insects; accompanies cattle and game animals, taking ectoparasites from their backs or from ground, and also follows the plough. Also reported as dropping stones from a height to break shells of Ostrich (*Struthio camelus*) eggs. Said to hide food items in sand under coconut palms. Forages in pairs and small groups; often in larger flocks at abundant food; roosts communally in stands of large trees, often in parks in cities and towns, where roosts can attract many hundreds or even a few thousand individuals.
Breeding. Season varies with onset of local rains: eggs reported Aug–Oct in Mauritania and Mali, Feb–Apr in Gambia, Apr–May in Chad, May–Jul in Burkina Faso, Jul–Aug in Niger, Mar–Jul in Nigeria, Apr–May in Ghana, Apr–Jun in Togo, Feb–Mar and Dec in Cameroon, Jan–Jul, Sept and Dec in Sudan, Feb–Apr in Ethiopia and Eritrea, Jan in Kenya, Jan–Feb and May–Oct in Uganda, throughout year in various parts of Tanzania, Jul–Feb in DRCongo, Oct in Gabon and PRCongo, May and Aug–Oct in Zambia, Jun and Sept–Nov in Malawi, Aug–Dec in Zimbabwe, Sept–Nov in

Botswana, Sept–Dec in Namibia, Sept in Lesotho, Jul–Jan (mostly Sept–Oct) in various parts of South Africa, and Aug–Dec (mostly Oct) in Madagascar. Monogamous, with probably lifelong pair-bond. Solitary nester. Nest built by both sexes, taking 11–12 days, a bulky structure of sticks, roots and sometimes wire, with deep cup lined with mud, dung, wool, string and grasses, usually in high tree fork, on telephone pole, pylon, artesian windmill or even tall building, rarely on cliff ledge; often same site used but freshly built nest constructed each year. Clutch 1–7 eggs, mostly 4 or 5; incubation by both sexes, female doing 75–80% of work and all of sitting overnight, period 18–19 days; chicks fed by both sexes, male alone feeds first-hatched chick for first few days while female incubates remaining eggs, nestling period 35–45 days. Nest occasionally parasitized by Great Spotted Cuckoo (*Clamator glandarius*).

Movements. Mainly sedentary. In wet years, N populations spread N into Saharan oases, some reaching 18° N (as at Nouakchott, in Mauritania) and can be common in C Chad, some reaching N Chad. In NW Central African Republic and W Sudan, seems to be present in good numbers only during Oct–May dry season, most moving out completely to breed. In Gambia, post-breeding movement from interior to coastal districts after start of rains. Situation farther S in Africa less clear, but adults seem to be sedentary, and younger birds most likely to move into new areas, but only one ringing recovery of individual more than 20 km from where ringed, and that had moved 47 km in a little over nine years. Vagrants recorded in S Algeria and once in S Libya.

Status and Conservation. Not globally threatened. Common and widespread, even locally abundant in low-lying, lusher parts of Africa. Common and widespread in lower-lying parts of Madagascar, and more thinly distributed on High Plateau. Distinctly localized or absent in mountainous or arid semi-desert and desert regions. In South Africa considered a minor pest, 17% of farms having a nest-destruction policy, and poison also used for controlling numbers of this species. On Kenyan coast, particularly about Mombassa, increasing population of *C. splendens* seems to be pushing out this corvid, which is harassed by mobbing behaviour of the smaller species. Its tolerance of humans and its omnivorous diet, however, should ensure a successful future for this crow.

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118. Ethiopian Raven

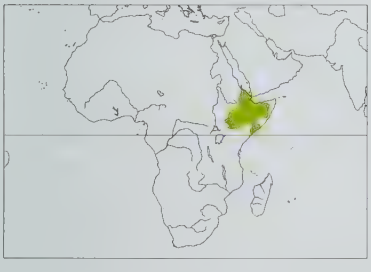
Corvus edithae

French: Corbeau d'Edith **German**: Somalirabe **Spanish**: Cuervo Etíope
Other common names: Dwarf/Somali Raven, Lesser Brown-necked Raven, Somali Crow

Taxonomy. *Corvus edithae* E. L. Phillips, 1895, Hainwaina Plain, Somalia.

Forms a superspecies with *C. albus* and *C. ruficollis*. Often treated as conspecific with latter, but close to former in size, structure and vocally. Hybridizes frequently with *C. albus* in SE Highlands of Ethiopia (and sporadic mixed pairs reported from most of range); recent observations suggest that interbreeding is not immediate when the two meet, and that some time is required for breeding-cycle synchrony to develop. Suggestion that present species is a population of all-dark *C. albus* considered unlikely, as some calls do differ and it replaces latter in the desert regions of the Horn of Africa. Monotypic.

Distribution. Eritrea, Djibouti, E & S Ethiopia, most of Somalia, extreme SE Sudan and N Kenya.



Descriptive notes. 46 cm; 435–450 g. Large corvid with tail of moderate length and distinctly graduated towards tip, stout bill and pointed throat feathers. Plumage black, glossed with green on crown and upperparts, gloss more violet on upperwing and tail; head and neck, including hindneck, dark glossy brown, duller and more blackish-brown when worn; feathers of throat and neck have white bases, those of rest of body are pale grey at base; underparts and underwing dull sooty black; iris dark brown; bill and legs black. Differs from *C. ruficollis* in smaller size and shorter bill, in flight by shorter wings and tail (and bill not regularly held pointing downwards). Sexes similar. Juvenile is duller and browner on head and body than adult. Hybrids with *C. albus* have pale or grey breast, or speckled breast and collar. Voice. Very similar to that of *C. albus*, usually a dry "wraaa" varying in pitch, becoming harsher and shriller in excitement; can be distinctly nasal and higher-pitched, reminiscent of call of *C. splendens*. Also has soft "wah-kah", second syllable rising in pitch, a winding double-note "korrrrh-karrrrh" and a husky "tschop". Various sounds uttered by feeding flock include brief clucking, clicking and gobbling sounds. Other transcriptions refer to a short, metallic "onk" or "kwonk", a double "rrawnk-rrawnk" and a flat "yack-yack".

Habitat. Open country, from deserts and bushy semi-deserts to dry savanna, and patchy cultivation, including coastal desert and inshore islands; in Kenya and Ethiopia exceptionally reaches 3000 m, but rarely above 2000 m and most numerous below 1100 m. Readily scavenges in villages and small towns.

Food and Feeding. Omnivorous. Diet probably similar to that of *C. albus*. Recorded items include carrion, small "animals", various invertebrates (insects and their larvae), ticks (Ixodoidea) and lice, and bird eggs; some plant material also taken, including grain. Forages on ground, alone, in pairs or in well spaced small flocks. Walks with ease, occasionally hops. Quite aggressive when in flocks, recorded as pointing bill skywards as a threat to approaching bird, which usually turns away. Outside breeding season, family parties gather into flocks of up to 100. Visits rubbish dumps, often boldly entering villages, sometimes with *C. albus*. Recorded as tearing into sacks to feed on grain; alights on camels to search for ectoparasites. Patrols seashore in search of carrion. Generally sociable at nocturnal roost, often in stands of palms, but said to prefer resting on ground by oasis (rather than in trees) for daytime roosting.

Breeding. Season chiefly Feb and May–Jun; eggs recorded Feb in Eritrea, Feb and May–Jun in Ethiopia, Mar–Jun (chiefly Apr and May) in Somalia, and Apr in Kenya. Pair-bond probably lifelong, and presumably monogamous. Solitary nester, with inter-nest distance 1·5–3 km; statements in older literature that this species nests in loose colonies not supported by modern observations. Nest, seemingly built by both sexes, a large untidy mass of sticks, cup lined with wool, feathers and plant fibres, usually placed in tree, more rarely on cliff ledge, in cave or on pylon or pole. Clutch 4–5 eggs, rarely 6; no information on incubation and nestling periods. Nest ocasionally parasitized by Great Spotted Cuckoo (*Clamator glandarius*).

Movements. Sedentary, as far as is known.

Status and Conservation. Not assessed. Probably not globally threatened. Common and widespread, but often somewhat localized. More field research required in order to determine population densities and precise relationship with *C. albus*. Its tolerance of humans and its scavenging habits should ensure a stable future, but interbreeding with the increasing and spreading *C. albus* could perhaps pose a threat in the long term.

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119. Brown-necked Raven

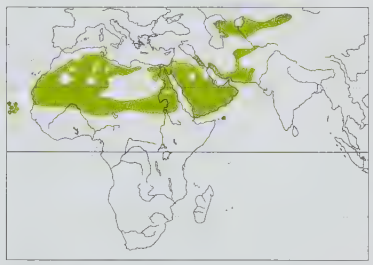
Corvus ruficollis

French: Corbeau brun **German**: Wüstenrabe **Spanish**: Cuervo Desertícola
Other common names: Desert Raven

Taxonomy. *Corvus ruficollis* Lesson, 1831, Santiago, Cape Verde Islands.

Forms a superspecies with *C. albus* and *C. edithae*; often treated as conspecific with latter, but that is probably closer to *C. albus* (with which it regularly hybridizes). Isolated population on Socotra (consisting of birds of relatively large size) possibly worthy of subspecific status. Monotypic.

Distribution. Desert regions of C Asia, N Africa and Middle East: S & C Kazakhstan S in plains to Turkmenistan and probably SW Tajikistan; Cape Verde Is; from S Morocco, Algeria (except N) and S Tunisia S to Mauritania and N Senegal, E to Libya (except N), N Mali, Burkina Faso, Niger, N Nigeria, C Chad, Egypt (including Sinai) and N & C Sudan; E Israel and W Jordan S throughout Arabian Peninsula, E through SE Syria, C & S Iraq and S & E Iran to SW Pakistan (Makran coast) and plains of N Afghanistan (probably also extreme SW Afghanistan, in Seistan); Socotra I (off NE Somalia).



Descriptive notes. 52–56 cm; 500–647 g. Large corvid with distinctly elongated and pointed throat hackles often slightly forked at tip. Plumage is mostly blackish, glossed dark green on crown and upperparts, glossed violet on upperwing and tail; nape, upper mantle, throat and side of neck shiny brown, glossed with bronze-purple; underparts sooty black, with violet gloss on breast and flanks; iris dark brown; bill and legs black. Distinguished from most races of *C. corax* mainly by smaller size, slimmer build, shorter throat hackles, slimmer bill, brown colour on head and neck, and in flight by narrower wings with more pointed wingtip. Sexes similar. Juvenile is less highly glossed than adult, with head and underparts duller greyish-black, becoming browner on flanks and belly. Voice. Typical call a dry, flat "aarg-aarg-aarg" of varying intensity, often reminiscent of the "caw" of *C. frugilegus*. Several other calls include drawn-out "crrrarrh" and abrupt "cruk-cruk", latter softer and less resonant than the deep croak of *C. corax*.

Habitat. Semi-desert and desert plains, mountain foothills including desert cultivation, dry savanna and oases, desert settlements, rubbish dumps and army camps; also barren islands with some cultivation (Cape Verdes). Favours areas with desert shrubbery, e.g. tamarisk (*Tamarix*), saxaul (*Haloxylon*) and wormwood (*Artemisia*). Although preferring plains, it is widespread in the higher ground of Eastern Desert of Egypt, where reported as breeding at up to 2000 m. Tends usually to be replaced in mountains by *C. corax* in places where ranges meet, but in many areas (e.g. Iran and W India) latter inhabits desert plains, too.

Food and Feeding. Omnivorous; mainly carnivorous. Takes wide range of terrestrial invertebrates and vertebrates, from molluscs, locusts and crickets (Orthoptera), beetles (Coleoptera), caterpillars, termites (Isoptera), spiders (Araneae) and ticks (Ixodoidea) to small snakes, tortoises, lizards, birds and small mammals. Robs bird nests, even visiting mangroves of inshore islands to take eggs of Western Reef Egret (*Egretta gularis*); kills sickly newborn lambs and gazelles. Report of a flock chasing a hare (*Lepus*), flock-members trying to hit it with their feet. Patrols roads in search of roadkills and shorelines for frogs and dead fish. Scavenges about settlements and rubbish dumps. Searches for ectoparasites on neck and head of donkeys and camels, also pecks at and aggravates sores on animals. Joins vultures and other scavengers around slaughterhouses and carcasses. Takes a good deal of plant material such as maize, barley, grass seeds, dates, fruit and berries, also various human food scraps in villages. Captive bird seen to hide surplus food items. Digs in ground, and turns over stones and dung in search of grain and insect larvae; walks and hops confidently on ground. Seen to catch locusts in flight with feet; observed to work co-operatively, one or two birds acting as "beaters" to flush locusts into air, to be captured by other ravens. Forages alone and in pairs; non-breeders form larger gatherings, reaching as many as 1000 individuals at roosts on rare occasions (such numbers reported from Israel and Cape Verdes), but in C Asia gatherings of 100 considered notable. Roosts in trees by choice, also at times on cliff ledges and increasingly so on roadside wires and electricity pylons.

Breeding. Eggs reported mid-Mar to Jun in Turkmenistan, Dec–Mar in Arabia, Feb–Mar in Israel, Feb–Apr over most of N Africa, Dec–Mar in Sudan, Nov–Dec in Niger, Jul–Oct in Mali, Jan–Apr, Jun and again Sept–Dec in Mauritania, and mid-Nov to mid-Apr in Cape Verde Is; generally single-brooded, occasional reports of two broods possibly referable to replacements after failure. Monogamous, with long-term, possibly lifelong pair-bond. Solitary nester; in Israel, average inter-nest distance 3·3 km, closest nests 1·2 km. Sometimes assisted by a helper (offspring from previous year). Nest built by both sexes, taking 5 days (in captivity), a bulky structure of branches, sticks and roots, cup lined with plant fibres, feathers, paper, wool, hair and cloth, usually at crown of tree, in treeless desert commonly on electricity pylon or telegraph pole, or even on ground among shrubby thickets (e.g. *Tamarix*), and disused building, pile of scrap metal or cliff ledge also used; often immediately beneath huge nest of Lappet-faced Vulture (*Torgos tracheliotus*) in Arabia; occasionally takes over old nest of raptor such as Long-legged Buzzard (*Buteo rufinus*) or Osprey (*Pandion haliaeetus*); nest-site may be used for many years. Clutch 1–7 eggs, usually 4–5, clutches smaller (2–3 eggs) in true desert environment (in N Africa, at least); incubation mostly or perhaps wholly by female, period 18–23 days; chicks fed and tended by both sexes, possibly sometimes also by a helper, nestling period 35–38 days; young fly strongly at 42–45 days, remain with parents for

several weeks before joining non-breeding roving flock. Age of maturity or first breeding not confirmed; stated to be in 2 years in Kazakhstan, but reported as 6 years for captives.
Movements. Sedentary in most of range. In C Asia, many from N populations of Kazakhstan move S in Oct, returning in Mar, although some remain as far N as L Balkhash all winter unless weather severely cold. Movements elsewhere less apparent, but marked passage towards both Sinai and Jordan reported at Eilat (S Israel) during Jul–Sept, with return Feb–Mar. In N Africa more sedentary, or movements not well understood, but reports of short-distance movements in Mali, Sudan and Mauritania, the last associated with onset of rains. Vagrants reported from Mediterranean coast of Israel, Canary Is, Gambia, NW Ethiopia, C Syria, SE Turkey and N Pakistan.
Status and Conservation. Not globally threatened. Widespread and common throughout extensive range. Reported as increasing in some areas owing to improved desert farming techniques; in Israel has increased dramatically since 1960s following proliferation of military camps and cultivation of desert. In Algeria seems to be spreading N; in Morocco uncommon and localized on arid plains to S of Atlas ranges. Few estimates of numbers made, but in Egypt population estimated at between 10,000 and 100,000 pairs; 500–1500 pairs estimated for United Arab Emirates, and in Israel considered to be several hundred pairs. Status in several countries requires clarification; in Syria suspected to be breeding in at least one area, and in Tajikistan believed to breed in SW, but confirmation required. The species is little known in Pakistan but common along Makran coast, with reports inland as far as Quetta in winter; in Afghanistan known with certainty only from arid plains around Andkhui (in extreme N), but highly likely also in Seistan (in SW). A pair of unknown origin probably nested c. 1990 on Gran Canaria, in Canary Is. No longer breeds in Bahrain. Clearly, this is a successful and adaptable species, although competition with *C. cornix* may restrict further range expansions in N Africa and the Middle East.
Bibliography. Ali & Ripley (1972, 1987b), Aspinall (1996), Bannerman & Bannerman (1968), Beaman & Madge (1998), Cramp & Perrins (1994), Cunningham (2009), Dementiev *et al.* (1954, 1970), Gallagher & Woodcock (1980), Goodman & Meininger (1989), Goodwin (1986), Grimmett *et al.* (1998), Harris *et al.* (1996), Harvey & Harvey (1992), Hazevoet (1995), Hollom *et al.* (1988), Jacobsen (1986), Jennings, M.C. (1981, 1995), Mackworth-Praed & Grant (1960), Madge & Burn (1994), McCarthy (2006), Meinertzhagen (1926, 1954), Rasmussen & Anderton (2005b), Roberts (1992), Roselaar (1995), Shirihai (1996), Shobrak (2005), Stepanyan (2003), Urban & Brown (1971), Vaurie (1954).

120. Common Raven

Corvus corax

French: Grand Corbeau **German**: Kolkrabe **Spanish**: Cuervo Grande
Other common names: (Northern Great Holarctic) Raven

Taxonomy. *Corvus Corax* Linnaeus, 1758, Sweden.
Recent molecular-genetic investigations suggest that this species consists of at least three groups that are currently taking relatively independent evolutionary paths. Little, if any, genetic exchange occurs between populations of Old World and New World, allowing these two groups to maintain slight, but distinctive genetic signatures, in addition to which those in Canary Is (samples from Fuerteventura I only) are morphologically and genetically distinct from other Old World ravens (apparently having diverged c. 650,000 years ago). Thus, population in Canary Is, those elsewhere in Old World, and those in New World appear sufficiently isolated today to evolve independently. In Old World, a variety of described morphological forms may have been especially distinct 1 million years ago, but today they intergrade extensively and do not have unique mitochrondrial signatures. Similar process appears to be reducing genetic diversity in New World, where two clades recognized in current samples of mitochrondrial DNA: "California clade" found throughout W USA and represents most individuals in Mojave Desert, and "Holarctic clade" (which occurs throughout Old World) identified from samples in N North America (Alaska, Canada, Maine and Greenland); ravens from the two clades co-exist in roughly equal proportions in large area of North America (including Washington and Idaho), and where mating patterns and clade identity known (temperate rainforests of Olympic Peninsula, in Washington state) intercladal pairing is common, suggesting substantial gene flow between clades and a shared current evolutionary trajectory. Existence of both clades in W North America suggests that ravens may have colonized North America at least twice. Initially, "California clade" and "Holarctic clade" diverged from each other c. 2 million years ago, perhaps as glacial advances pushed original population into S refugia, and these distinct "California clade" ravens remained isolated from other ("Holarctic clade") ravens for c. 1 million years; during this time their sister-taxon, *C. cryptoleucus*, evolved, these taxa differing by 1·75% to 1·8% (suggesting that they diverged 1·1–0·6 million years ago, well after the two clades of present species diverged). "Holarctic clade" may have reinvaded North America across Bering Strait in last 15,000 years in the company of humans and grey wolves (*Canis lupus*). Many races described on basis of clines in morphology (decrease in size from N and high-elevation portions of range to S and desert parts) and plumage (decrease in bluish gloss and less pronounced lanceolate throat plumes from N to S); nominate race grades into *laurencei* in C Europe, and into *kamtschaticus* in W Siberia and W Russia and S to Black Sea, Caucasus, N Iran and Kazakhstan. Eleven subspecies currently recognized.
Subspecies and Distribution.
C. c. principalis Ridgway, 1887 – Alaska E across ice-free portions of Canada to coasts of Greenland, S in USA to Pacific coast of Oregon and Washington and, in E, in Appalachian Mts S to N Georgia.
C. c. sinuatus Wagler, 1829 – Rocky Mts from SW Canada (British Columbia) S in E USA through Idaho, Montana, Utah and Colorado and through Great Plains, Great Basin and SW mountains, to mainland Mexico and Nicaragua.
C. c. clarionensis Rothschild & E. J. O. Hartert, 1902 – SE USA (N California) S through NW Mexico (Baja California, including Clarion I) and E through Mojave Desert.
C. c. varius Brünnich, 1764 – Iceland and Faroe Is.
C. c. corax Linnaeus, 1758 – NW Europe from British Is and Fennoscandia S through W & C Europe and E to C Siberia (R Yenisei).
C. c. kamtschaticus Dybowski, 1883 – Siberia E to Kamchatka, Commander Is and coastal regions of Sea of Okhotsk, S to N Mongolia, NE China, Sakhalin I, Kurils and N Japan (Hokkaido).
C. c. hispanus E. J. O. Hartert & O. Kleinschmidt, 1901 – Iberian Peninsula, Balearic Is, Corsica, Sardinia and Italy.
C. c. laurencei Hume, 1873 – E Greece and Cyprus E through Middle East to E Kazakhstan, W China (except mountains) and N India.
C. c. tibetanus Hodgson, 1849 – C Asia from Tien Shan and Pamirs S to Himalayas and W China mountains.
C. c. canariensis E. J. O. Hartert & O. Kleinschmidt, 1901 – Canary Is.
C. c. tingitanus Irby, 1874 – coastal regions of N Africa from Morocco (S to pre-Saharian Atlas) E to Egypt.
Descriptive notes. 58–69 cm; 585–2000 g. The largest corvid; large, powerful bill with nasal bristles covering half or less of exposed culmen, throat feathers long and lanceolate (especially on male) and erected during dominance displays; in flight, long, fairly broad wings with prominent fingers, especially long tail often spread to form diamond shape. Nominate race is black, with greenish gloss on head and tail, primaries and underparts, more bluish-purple gloss on upperparts and rest of wing; bases of neck feathers brownish-grey; plumage generally duller and browner, with less gloss, when worn; iris dark brown; bill and legs black. Distinguished from congeners mainly by large size and shaggy-looking throat, in flight mainly by tail shape. Sexes similar, male significantly larger than female. Juvenile is duller than adult, with less metallic sheen, lacks lanceolate throat plumes, has iris light blue, soon becoming grey; immature has wing and tail feathers dull and brownish; base of bill gradually turns from yellowish to black during first year, and tongue, gape and palate turn from red to mottled grey/black to fully black during first two years, depending on social status; dominant birds attain black mouth lining within 1 year, but subordinates may not obtain black lining for several years. Races differ mainly in size: *varius* is a large race, larger and less glossy than nominate, with bases of neck feathers whitish; *kamtschaticus* is larger than nominate, with clearly larger and thicker bill; *hispanus* has relatively short wings and more arched bill than nominate; *laurencei* is slightly larger than nominate, and often has worn, brown plumage on nape, mantle and throat; *tibetanus* is very large and highly glossy, with longest throat hackles; *tingitanus* is small, with very short, stout bill, long wings and short tail, short and less lanceolated throat plumes, has plumage glossy and "oily"; *canariensis* is similar to previous, but has distinct brownish plumage, bill perhaps somewhat smaller; *principalis* is very large, varying clinally (from massive in N of range to relatively large in NE & NW continental USA), has largest bill of all races; *sinuatus* is relatively small (except perhaps in farthest S of range), with short wing and tail, short and slender bill, and small feet and skull; *clarionensis* is smallest race in North America. Voice. Large repertoire of at least 20 distinct calls of known function, 79 call types distinguished spectrographically, many mimicked sounds, and numerous utterances of unknown meaning. At least some calls are learnt socially from mates, and especially from nearby (within 12 km) birds of same sex. Adults "caw" loudly and hoarsely, this deep-pitched croaking varying in pitch and intensity to convey caller's motivation. Territorial adults "quork" often in sequence ("quork-quork...quork-quork"), frequently during aerial rolls or dives in defence of territory; mated pairs frequently give loud, patterned knocking (like sound of two wood blocks rapped together) audible for several kilometres, likely serving to defend territory from long range. Loud, harmonically rich "hoots", "yells" or "honks" used by territorial adults to thwart intruding conspecifics. Adult female often gives knocking calls in sequences of 2, 3, 7 or more syllables when excited. Very rapid knocking ("rattling") by female often occurs during duets between mateds after territorial defence or during courtship; male and female often perch side by side, bend over and, as female spreads wings and rattles, male opens bill, fluffs throat feathers and moves head in choking motion while uttering quiet garble of clicks, hisses and gurgles and flashing nictitating membranes ("air call"). Pair responds to predators, especially near nest, with a series of staccato "cluck" calls while flying excitedly with rapid and shallow beats; somewhat similar "ku-uk-kuk" given by one raven pursuing another in aerial chase, attacking individual uttering this call as it closes in or dives at intruder. Adults give large variety of bell-like, hiccup, dripping "woo-woo", and "toot" calls of unknown function (may be regionally, locally or individually distinct); "growls", "whines" and "screams" common among jostling birds entering communal roost, and goose-like "honks" often given during morning departure. Juveniles and females beg in typical corvid fashion to be fed by their parents and mates. Juvenile food-begging calls change into "yells" of immatures, which given at sight of defended food ("haa") or as dominants approach food ("who"). Two immatures "trill" in escalating vocal bouts that can lead to physical fights. Soft, babbling renditions of full repertoire of sounds common, especially by lone immatures or those discovering new foods.
Habitat. Extreme habitat generalist, breeding throughout forested and open coastal, steppe, mountain, desert, tundra and cliff regions of Northern Hemisphere. Generally in more open habitat in S (typically shrublands and deserts) and N (shrublands and tundra) portions of range where cliffs, sparse trees, including Joshua trees (*Yucca brevifolia*) in Mojave Desert (SW USA), and human structures afford nest locations; generally in coniferous and broadleaf forests in middle latitudes, where tree-nesting often more common than cliff-nesting. Abundant in temperate (coniferous) rainforest along N Pacific coast of North America; historically common in all human settlements within range, but today frequents human refuse tips, patrols roadways and recreational sites (least so in NE USA), and inhabits rural farms and settlements, small towns, and a few large cities. In W North America abundant in Anchorage (Alaska) and locally abundant in coastal and most natural habitats in Los Angeles, Riverside, San Diego and San Francisco (California metropolitan areas). Generally rare in large cities throughout rest of range, with some exceptions (e.g. Ulaanbaatar, Mongolia). Some avoidance of urban areas may reflect unsuitable habitat, abundant competitors such as gulls (Laridae) and other corvids, recent and extensive devastation, and historical persecution.
Food and Feeding. Opportunistic scavenger, historically closely associated with large carnivores, most notably wolves, and wasteful omnivores, notably humans. Eats huge variety of animals and plants. Preys on adult and nestling birds, eggs, small mammals (regularly young lagomorphs and occasionally adult lagomorphs and newborn lambs), sick and dying larger mammals (including sheep), toads, snakes, juvenile turtles, fish, and consumes invertebrates, notably Orthoptera, Lepidoptera, Coleoptera, craneflies (Tipulidae), ants (Formicidae), slugs, scorpions, earthworms, snails and diversity of marine invertebrates; scavenges garbage and slaughterhouse offal, dung, and nearly any kind of carrion, including sheep and cow placentas, discarded entrails of hunted animals, dead fish and whales, and road-killed mammals, birds and reptiles. Plant matter includes fruits, grains, berries, buds, and calcareous seaweed (*Corallina officinalis*); on some islands of Canary Is, fruit (especially *Opuntia* and *Ficus*) dominates diet. Predatory behaviour may result in significant local reductions in nesting success of colonial-nesting birds, also rare species such as desert tortoise (*Gopherus agassizii*). Locates food by sight, sound, perhaps also by olfaction at very close distances. Actively scans for carrion, investigates locations of gunshots, wolf howls, and calling conspecifics, watches foraging birds and mammals for cues; actively hunts from perch, in flight and on foot. Excessively cautious and wary around new foods. Where large animal carcasses a primary food, and when carcasses especially widely dispersed and ephemeral (e.g. in snowy N regions), naive ravens follow roostmates over many kilometres to newly discovered food bonanzas. Often roosts communally very close to semi-permanent food resources (e.g. rubbish dumps, residences offering continuous food supplements); wandering non-breeders the most frequent participants in winter roosts, and hence most apt to co-operate in sharing of information regarding food and other resources, these temporary groups of mostly unrelated and often different birds benefiting from sharing information because of increased food encounter rates and increased ability to procure foods defended by dominant breeding pairs. Breeding pairs often defend food discovered on their territory from single wanderers or small groups. Caches a variety of foods,

mostly on ground, at all times of the year; caching may be triggered by ephemeral or contested foods (under controlled experiments, ravens do not cache when food continuously available), but seen to cache from landfills where food (albeit of varying quality) continuously available; eggs may be cached whole and placed in micro-sites suitable for long-term storage; large or scattered items may be prepared away from cache site to reduce transportation costs (e.g. strips of meat and individual crackers collected to make a single load, which then carried to cache site). Combats cache raiders by sneaking out of view to cache, making false caches, and moving caches from locations perceived to be known to others.

Breeding. Breeds early in the year when snow often blankets the ground. Laying from late Feb in most of range, earlier in some areas, e.g. Dec in far S, and later in far N and at higher altitudes, e.g. mid-Apr in Greenland, N Siberia and W Chinese mountains; double-brooding rare (once case known in USA, at Riverside, in California). Socially monogamous, with pair-bond probably lifelong; occasional extra-pair copulations observed. In most situations, pair inhabits all-purpose home range throughout year. Defended space within home range poorly understood, but territory and defence of it is apparently restricted to area within 1–5 km of nest; defence involves vigorous chases of intruders accompanied by loud vocalizations, and physical attack with bill and feet if intruder caught. Both sexes procure nest material, but female appears to do most of construction work, especially shaping nest bowl, nest construction taking 1–3 weeks; a large and bulky platform 40–153 cm in diameter and 20–61 cm tall, made from dead sticks (25–150 cm long, 0·5–3 cm in diameter), lined with fine roots, grass, string and other bits of rubbish, and with mammal fur to make an inner cup 22–30 cm in diameter and 13–15 cm deep; placed 3–30 m up in stout, lower branches of tree (often few substantial branches below nest), or 5–30 m or more above ground on upper third of steep cliff (often well protected beneath overhanging block or ledge, in crack or in small cave), or up to 46 m high on artificial structure such as utility pole building, sign, radio tower, abandoned vehicle, oil derrick, bridge, irrigation pipe or windmill; sometimes old nest refurbished and reused. Clutch 1–8 eggs, typically 4–6; incubation by female, male occasionally assisting, period 20–25 days; hatching asynchronous, chicks brooded and fed by both parents, nestling period 4–7 weeks; fledglings remain with parents for a few weeks to several months, typically leave natal territory by late summer. Average brood sizes in most areas (Britain, Ireland, W USA) 2·5–3·6 young per nest, but slightly larger averages of 3·8 and 4·2 recorded in Utah and Oregon; lowest fledging success on Olympic Peninsula (Washington, in W USA), where 35 pairs fledged average of 1·2 young per nest, average elsewhere in North America and Britain ranges from 1·7 to 3·1. Maximum recorded lifespan in the wild 13 years 4 months, and credible reports of captives living for 40–80 years; survival during first year variable, 38% to 74%, likely dependent on vulnerability to mammalian predators shortly after fledging, and annual survival of breeders can be lower than expected on basis of body size (e.g. on Olympic Peninsula average 68·2% and in Mojave average 87%).

Movements. Relatively sedentary. Breeders may fly up to 30 km from nest to predictable food sources and travel throughout 12–1950 km² home ranges. Non-breeders less sedentary, ranging widely and nomadically over 1200 km² to more than 1900 km² each winter among concentrated, but ephemeral, food sources; may routinely travel 20–70 km one-way from communal roost to daily feeding locations. In Britain and most of North America, spends most of life within 50 km of natal site; in Britain, only four birds, all non-breeders in first two years of life, travelled more than 200 km from natal territory. Maximum distances between breeding and recovery sites include 551 km in Britain and 480 km in W USA (Oregon). In Greenland and other places above 60° N (or at extreme altitudes) considerably less sedentary; during winter, adults and juveniles from interior Greenland travel over 150 km to reach coast; one fledgling moved 811 km from Kangerlussuaq to S tip of Greenland in fewer than 146 days; another moved from N Greenland 1120 km to S.

Status and Conservation. Not globally threatened. Common to locally abundant. Occurs in widely distributed, low-density, and self-sustaining populations across most of its range; variation on this theme often directly related to past persecution or modern subsidizing by humans. In much of W North America and Europe populations expanding, often at alarming rates, because human activities provide food, water and nest-sites that increase reproduction and survival (especially of juveniles), and allow territories to become established far from natural sites (especially in open tundra and shrublands); in some of these situations populations locally extremely dense. Recent studies, however, reveal that some locally dense populations (W Mojave Desert) are maintained by immigration of non-breeders to locally abundant food subsidies; W Mojave Desert populations outside urban areas may not be demographically self-sustaining. In W Europe, this species was valued as a sanitary engineer in medieval cities, but widely persecuted from mid-1600s to mid-1900s or later. Wonder and appreciation were replaced with fear and apprehension as ravens were increasingly viewed as scavengers on the dead (including humans) and harbingers of evil. As a result, European populations were reduced, often to point of creating gaps in the species' distribution (e.g. throughout much N & C Europe). Persecution has been greatly reduced in most parts of Europe today (but continues in Iceland and Greenland) and this corvid is reclaiming former haunts, even in highly developed parts of London, Moscow, Berlin, Vienna and Warsaw. Active reintroduction efforts, in addition to reduced persecution and increased subsidization, have aided its return to parts of Germany, Netherlands and SE USA. Although general persecution reduced in recent times, increasing populations of this species in much of W USA have led to conflict and targeted killing campaigns. Increasing numbers often gather conspicuously at rubbish dumps, agricultural fields, desert water impoundments, and open-country petroleum development sites; this can bring them close to crops and sensitive wildlife species, and convince resource-managers and members of the public that control is necessary. For control of this corvid, managers are advised to integrate lethal control with behavioural modification and reduction in subsidies. To date, little has been done to reduce subsidies (engrained human attitudes difficult to change), but some landfills and artificial nest-sites have been retrofitted to reduce raven use; rather than removing subsidies, managers often simply opt to kill ravens. Large numbers have been shot and poisoned in California, Oregon, Utah and Nevada, with limited, local and short-term benefits to pistachios (*Pistacia*), Sage Grouse (*Centrocercus urophasianus*), the *browni* race of Least Tern (*Sterna antillarum*), Sandhill Cranes (*Grus canadensis*), desert tortoises, and Kentish Plovers (*Charadrius alexandrinus*). Lethal control may be ineffective, as removal of this corvid allows other generalist predators to increase, and wide-ranging ravens quickly recolonize areas when lethal control ends if food, water and nest subsidies not reduced. In addition, many lethal control efforts focus on concentrations of non-breeding individuals, leaving breeding population intact to fuel continued population growth.

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121. Fan-tailed Raven

Corvus rhipidurus

French: Corbeau à queue courte **German**: Borstenrabe **Spanish**: Cuervo Colicorto

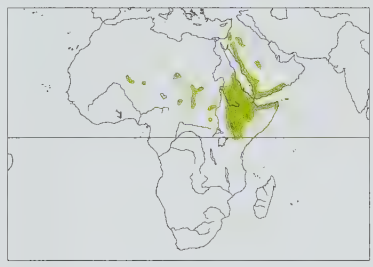
Taxonomy. *Corvus rhipidurus* E. J. O. Hartert, 1918, Massaua, Eritrea.

Sometimes allocated its own monotypic genus, *Rhinocorax*. Certain morphological features, notably the nasal bristles and wing and tail shapes, indicate affinity with African ravens rather than N ones. Two subspecies recognized.

Subspecies and Distribution.

C. r. stanleyi Roselaar, 1993 – E Israel, Palestine and W Jordan, mountains of W & C Arabia (Hejaz and Asir Mts; Tuwaiq escarpment, Gebel Aja and Babel Sama) E into extreme W Oman.

C. r. rhipidurus E. J. O. Hartert, 1918 – E Mali (Adrar des Ipras and Homberi), NW Niger (Aïr Massif and Zinder), Chad (Tibesti and Kapka Mts and elsewhere), NE Central African Republic, highlands of Sudan (including Gebel Elba, on Egyptian border), most of Ethiopia and E to Eritrea, Djibouti and W Somalia, and E Uganda and N & W Kenya.



Descriptive notes. 46–47 cm; 512–734 g. An unmistakable crow-sized raven, wings projecting well beyond remarkably short tail (rounded at tip) when perched or on ground, relatively flat crown and small, quite stubby bill, nasal bristles fan-shaped and upcurving, concealing basal third of upper mandible, throat hackles slightly elongated, rather broad and forked at tip; in flight, extremely short tail and and broad-based wings, giving peculiar bat-like appearance. Plumage is black, with oily bluish-purple to dark green sheen, more brightly glossed in fresh plumage, duller but still black when plumage worn; feathers of throat and side of neck brownish-black with bronze sheen; feathers at side and near of neck have white bases, remainder have grey bases; underwing-coverts sooty black, contrasting with lighter underside of flight-feathers when seen overhead; iris dark brown; bill and legs black. Sexes similar, female distinctly smaller than male (obvious when the two seen together). Juvenile is similar to adult, but throat feathers shorter and more rounded, much less glossed, wing and tail feathers becoming browner through bleaching. Races differ only in size: *stanleyi* is c. 10% smaller than nominate. Voice. Typical call a far-carrying, rather high-pitched "craa-craa" or a downslurred "krroo-ah"; also gives prolonged guttural growling, which may vary in pitch. Variety of other calls, especially short conversational notes, may be given; sometimes strung together as a form of song composed of various clucks, squeals and bubbling sounds.

Habitat. Barren desert cliffs, gorges and canyons, from well below sea-level (Dead Sea) to 2400 m, rarely to 4000 m. Forages around desert settlements and oases.

Food and Feeding. Omnivorous. Eats grain, berries, dates, insects and other invertebrates; occasionally robs nests of other birds, taking both eggs and nestlings. Scavenges about human habitation, waiting on rooftops for scraps and waste to be discarded. Picks grain from animal droppings; catches locusts (Acrididae) in flight with its feet. Rides on backs of goats and camels, searching diligently for ectoparasites, pulling out tufts of hair in the process. Reported as hammering ping-pong ball with a stone (a rare instance of tool-using by a bird). Drinks frequently. While on ground, often holds bill partially open as if panting, giving impression that bill thicker than it really is. Feeds chiefly about desert cultivation, settlements and oases; foraging flocks in fields can give impression like that of a *C. frugilegus* flock. Spends most of time in the air, soaring and tumbling over cliff faces, making good use of thermals; at high elevations soars on thermals for considerable distances in search of food. Plays with sticks, feathers and the like, carrying them high and releasing them, then acrobatically dropping down to catch them again. Usually in pairs or small family parties, occasionally in larger gatherings at rubbish dumps and similar sites. Roosts in stands of palms by oases; roost of over 1000 reported in N Yemen in late Nov, having built up from 25 in early Sept. Roosts often mixed with *C. ruficollis*.

Breeding. Most data from Middle East, especially Israel. Eggs reported early Mar to late Apr in Israel, Dec–Jun (most mid-Feb to May) in Saudi Arabia, mid-Apr to early Jun in Sudan, Eritrea and Somalia, Feb–Mar, May–Jun and Sept in Ethiopia, Jan–Jun in Kenya and Jun in Niger. Monogamous, probably with long-term pair-bond. Typically solitary nester; exceptionally, 2–5 pairs nesting only 50–200 m apart on same ledge. Nest a flimsy structure of sticks, twigs and roots, cup lined with wool, hair and cloth, places usually in crevice or shaded ledge on sheer cliff face, extremely rarely in tree or on building. Clutch 2–6 eggs, usually 3–4; incubation period 18–20 days, nestling period 35–40 days; no information on roles of sexes. Nest occasionally parasitized by Great Spotted Cuckoo (*Clamator glandarius*).

Movements. Mainly sedentary. In winter at N limit of range in Israel and Jordan, dispersal S down Arava Valley towards Gulf of Aqaba; some dispersal of Arabian populations to lower-lying coastal regions from Tuwaiq escarpment and Dhofar during Sept–Mar. Reports of small parties and flocks (once over 1000 individuals) thermalling very high over N Yemen, often mixing with migrating raptors before returning; such occasions no doubt responsible for exceptional records of vagrants in Syria, SE Turkey, Upper Egypt and S Libya. African populations show little inclination of moving far, although the Libyan bird assumed to have wandered up from Tibesti (N Chad).

Status and Conservation. Not globally threatened. Locally common, even locally abundant (e.g. in Arabian Peninsula). Population in Israel estimated at 300 pairs, centred on cliffs and wadis flanking Dead Sea. No estimates from elsewhere, but locally common in Djibouti, Eritrea, Ethiopia, Sudan, Kenya and Chad; said to be rare in Mali, and status in Central African Republic uncertain, based on one record in NE of country. Until recently a few pairs nested in mountains of Sinai (NE Egypt), but now only a few individuals turn up there in winter. Believed to have declined in Israel over recent decades through competition with steadily increasing population of *C. ruficollis*. Protected at a number of nature reserves in Israel and national parks in some of the African coun-

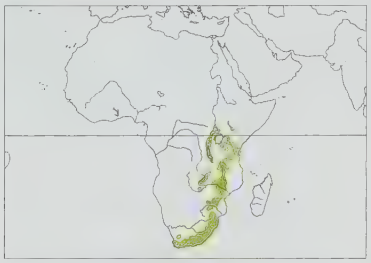
tries in which it is found. In parts of Saudi Arabia has become a local nuisance to date-farmers, who cover their ripening fruit with sacking to protect the crop from the ravens.
Bibliography. Ash (1983), Ash & Miskell (1998), Borrow & Demey (2001, 2004), Britton (1980), Castell *et al.* (2002), Cramp & Perrins (1994), Fry *et al.* (2000), Gallagher & Woodcock (1980), Gaskell (2005), Goodwin (1986), Hall & Moreau (1970), Jennings, M.C. (1981, 1986, 1995), Lewis (1989), Mackworth-Praed & Grant (1960, 1973), Madge & Burn (1994), Meinertzhagen (1926, 1954), Phillips (1982), Roselaar (1993), Shirihai (1996), Urban & Brown (1971), Welch & Welch (2006), Wilson (1990, 1993), Zimmerman *et al.* (1996, 1999).

122. White-necked Raven

Corvus albicollis

French: Corbeau à nuque blanche **German**: Geierrabe **Spanish**: Cuervo Cuelliblanco
Other common names: Cape/White-naped Raven, African White-necked Raven

Taxonomy. *Corvus albicollis* Latham, 1790, Great Namaqualand, South Africa.
Forms a species-pair with *C. crassirostris*, the two sometimes placed in a separate genus, *Corvultur*. Monotypic.
Distribution. Uganda and W Kenya S over E DRCongo, Rwanda, Burundi, Tanzania, Zambia, Malawi, N & W Mozambique, most of Zimbabwe (except W), E & S South Africa (S to Cape Town), Swaziland and Lesotho.



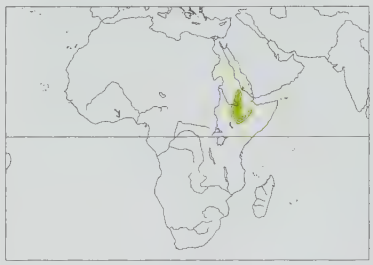
Descriptive notes. 50–56 cm; 762–1157 g. An unmistakable very large, chunky raven with relatively short tail and broad-based wings; nasal bristles fan-shaped, upcurving, almost concealing basal third of upper mandible, throat feathers pointed and slightly forked; massive bill with strongly arching culmen, making bird appear front-heavy in flight. Head, neck and underparts are blackish-brown with purplish sheen, lores blacker; large white patch across lower nape and upper mantle, extending slightly onto side of neck; feathers of foreneck and breast often fringed whitish, forming weak breastband; remainder of plumage, including wings and tail, coal-black with green sheen (this sheen is lost through wear, and plumage then becomes overall dull brownish in tone); iris dark brown; bill black, ivory-white tip; legs black. Sexes similar. Juvenile lacks white tip of bill, is duller than adult, often with some dark streaking in white nape patch, and sometimes with scattered white feathers over neck and breast. Voice. Typical call a surprisingly high-pitched, short, rolled "kraa" or longer "krrraaa", often uttered without rolling quality (then sounding like bleat of a trumpet). Also reported is a short metallic clattering "cluk-cluk-cluk", directed, with head bowed, at presumed mate.
Habitat. Inhabits hilly and mountainous country, occurring in less barren habitats than *C. rhipidurus*. Patrols over grassland, rugged hills, gorges and open hill forest. Chiefly found between 1000 m and 3000 m, but down to sea-level in South Africa and recorded up to 5800 m in N Tanzania (Mt Kilimanjaro).
Food and Feeding. Omnivorous, but mainly carnivorous. Takes wide range of invertebrates and vertebrates, from locusts (Acrididae), beetles (Coleoptera), caterpillars, beetle larvae and ticks (Ixodoidea) to small tortoises, lizards, snakes, small birds and small mammals. Robs bird nests, taking both eggs and nestlings, even eggs of Verreaux's Eagle (*Aquila verreauxii*), as well as those of domestic chickens and geese; also kills sickly newborn lambs. One in S Kenya seen to glide down from tree, snatch a Superb Starling (*Lamprotornis superbus*), hold it in one foot, and peck repeatedly at its head; it then plucked some head feathers from starling, but stopped and half-covered the victim with grass and earth, before leaving; raven returned later and immediately retrieved the starling, severed the head, and buried the rest under a grass clump; it returned several more times, each time eating just a few morsels from the carcass. Patrols roads in search of roadkills and lakeshores for frogs and dead fish. Scavenges about settlements and rubbish dumps, becoming very bold and confiding where unmolested; reported as stealing and swallowing bar of soap at a camp. Searches for ectoparasites on backs of cattle, and reported as carrying small tortoises high up and dropping them on to rocky ground to break the shell. Eats some plant material, such as maize, peanuts, fruit and berries, and seen to take a honeycomb and various human food scraps from camps and villages. Forages chiefly on ground, walking with bold swaggering gait and rather upright carriage, hopping or side-stepping with agility. Will feed inside tree canopy, picking insects from among foliage. Typically forages alone or in pairs, but large gatherings of up to 150 individuals reported on occasion, and exceptionally 800; such flocks largely non-breeders and quite nomadic by nature. Like *C. rhipidurus* spends much of day in thermalling high, often with vultures, and enjoys "playing", swooping and diving over cliff faces, dropping sticks and small stones and catching them again, often somersaulting (wind then producing loud swishing or whining sound through the primaries) before catching item again, or allowing partner to catch and pass it. Roosts communally on cliffs in gatherings of up to 40, rarely several hundred.
Breeding. Eggs reported Oct–Dec in Kenya, Aug–Oct in Uganda, Feb in DRCongo, Oct in Tanzania, Sept–Nov in Malawi, Sept in Zambia and Zimbabwe, and Aug–Dec in South Africa. Monogamous, with long-term pair-bond; partners of one pair known to have been together for 14 years. Solitary breeder. Nest a large platform of twigs and sticks, deep cup lined with wool, grass, rags, feathers and hair, mostly c. 30 m from ground and usually in crevice or on ledge of sheer cliff face, extremely rarely in tree. Clutch 2–7 eggs, usually 4; incubation believed by female alone, period 19–21 days; chicks fed mostly by female by regurgitation, male may attend but rarely helps, nestling period 21–28 days; young remain with parents until up to a few weeks of start of next breeding season. In S of range, averaged of 2 young fledged per nest.
Movements. Chiefly sedentary, but large flocks of non-breeders become semi-nomadic and wander throughout non-breeding season. Vagrants have turned up in Botswana and in N Kruger National Park (South Africa); wandering individuals recorded in SW Namibia and vagrant reached SW Sudan.
Status and Conservation. Not globally threatened. Locally common; numerous reports of non-breeding flocks suggest even locally abundant. No population estimates. Considered a pest in parts of South Africa and elsewhere because of its sheep-killing habits, and is widely trapped, poisoned or shot and its nests destroyed by farmers. Marked decrease reported in extreme N part of range in Kenya as a result of eating poisoned carcasses put out for predators of cattle and sheep.
Bibliography. Britton (1980), Chapin (1954), Cyrus & Robson (1980), Fry *et al.* (2000), Goodwin (1986), Hall & Moreau (1970), Harrison *et al.* (1997), Hockey *et al.* (2005), Irwin (1981), Jackson *et al.* (2001), Lewis (1989), Lewis & Pomeroy (1989), Mackie & Landman (1982), Mackworth-Praed & Grant (1960, 1973), Maclean (1993), Madge & Burn (1994), Meinertzhagen (1926), Parry (1981), Sinclair *et al.* (1993), Tarboton *et al.* (1987), Uys (1966), Winterbottom (1975), Zimmerman *et al.* (1996, 1999).

123. Thick-billed Raven

Corvus crassirostris

French: Corbeau corbivau **German**: Erzrabe **Spanish**: Cuervo Picogordo

Taxonomy. *Corvus crassirostris* Rüppell, 1836, Halai, Eritrea.
Forms a species pair with *C. albicollis*, the two sometimes placed in a separate genus, *Corvultur*. Monotypic.
Distribution. Highlands of Eritrea and Ethiopia.



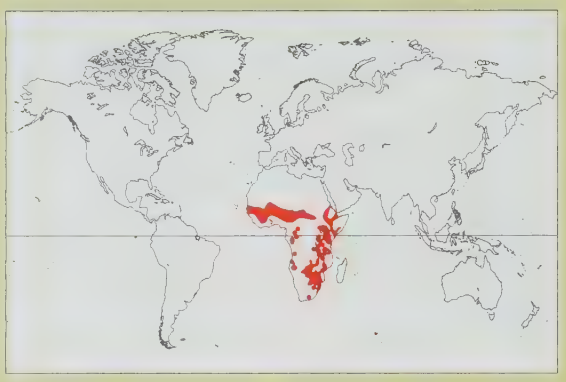
Descriptive notes. 60–64 cm; one bird 1135 g. An unmistakable very large raven with relatively long, wedge-shaped tail, and disproportionately massive bill with strongly arching culmen, making bird appear front-heavy and almost hornbill-like in flight; feathers of head very short and dense, those of throat short and rounded, nasal bristles relatively shorter than in *C. albicollis*, upcurving, but not reaching culmen ridge. Plumage is almost wholly black, upperparts with blue or purple-blue gloss, underparts duller black; throat and side of neck brownish-black; relatively large white patch on upper nape extending in white line down centre of nape; iris dark brown; bill black, ivory-white tip; legs black. Sexes similar. Juvenile lacks white tip of bill, is duller, more sooty brown, than adult, with culmen ridge less highly arched. Voice. Most calls remarkably high-pitched for one of the world's biggest corvids. Typical call a scraping bubbling sound, also a low, guttural wheezy croak. Also gives deep pig-like grunt, "urrrk" or "grrrarrr", and a double "harr-harrr" cough.
Habitat. Frequents both open and forested mountainous country, especially with escarpments and sheer cliffs; also cultivations, lakeshores (equally at home by fishermen's landing stages with large trees nearby), and even towns and cities (including Addis Ababa) so long as large trees present. Found between 1200 m and 4100 m, mainly 1500–3000 m.
Food and Feeding. Carnivorous, but some plant material taken. Diet includes locusts (Acrididae) and beetle larvae (Coleoptera), caterpillars, lizards, snakes, small birds and small mammals. Robs bird nests, taking both eggs and nestlings. A true scavenger, becoming quite fearless when living near human habitation; by some Rift Valley lakes attends fishing boats offloading catches on shore, shoulder to shoulder with scavenging Marabous (*Leptoptilos crumeniferus*) and Hamerkops (*Scopus umbretta*). Joins vultures to feed on carcasses, vultures appearing to give way to it (and seeming in awe of its massive bill); steals bones dropped by Bearded Vultures (*Gypaetus barbatus*). Digs out mole-rats (Bathyergidae) from high alpine moorland, and other rodents from grassland. Scatters dung to get at insects and grain, virtually turning head upside-down while executing the scattering movements. Digs planted grain from fields, sometimes causing minor damage to crops. Feeds chiefly on ground, walking with bold swaggering gait and rather upright carriage, hopping or side-stepping with agility. Lifts head to make bill more imposing (vultures give way at carcass even if merely approached by raven with bill held towards them). Will also feed inside tree canopy, picking insects and berries from among foliage. A captive individual habitually hid surplus food items. Typically forages alone or in pairs, and less likely to form large gatherings than is *C. albicollis*; groups of more than ten individuals unusual. Soars on thermals and enjoys aerobatics, playing with sticks. Roosts in well-leaved large tree, normally in pairs or family groups.
Breeding. Eggs reported Dec–Apr in Ethiopia; occasionally double-brooded. Long-term pair-bond. Solitary breeder. Nest a very large platform of branches and sticks, with hollowed area on top lined with rags, coarse hair, grass, wool, string and the like, placed c. 15–20 m above ground at junction or crossing of strong branches in large tree, more rarely on cliff ledge. Clutch 4 eggs; no information on incubation and fledging periods; young remain with parents for several months after leaving nest.
Movements. Primarily sedentary; wanderers recorded in E Sudan (Famaka and Galabit), in NW Somalia (Ban Seila), and in Moyale district of S Ethiopia close to Kenyan border.
Status and Conservation. Not globally threatened. Locally common, perhaps even locally abundant. No population estimates. Widespread in W & SE Highlands of Ethiopia S to Sidamo, and in Eritrea in highlands E of Asmara and S highlands. Adaptable and opportunistic; widely recorded in a range of habitats, from montane grassland and alpine moorland to open forest, city parks and large gardens.
Bibliography. Alamargot (1976, 1983, 1990), Ash & Atkins (2009), Ash & Gullick (1989), Fry *et al.* (2000), Goodwin (1986), Hall & Moreau (1970), Londei (1995), Mackworth-Praed & Grant (1960), Madge & Burn (1994), Meinertzhagen (1926), Stewart (1913), Urban (1980), Urban & Brown (1971), Wilson & Balcha (1989).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family BUPHAGIDAE (OXPECKERS)



- Medium-sized passerines with heavy, laterally flattened bill; plumage dull brownish and buff, with contrastingly bright eye wattle and bill.
- 20 cm.



- Africa.
- Savanna and farmland with large ungulates.
- 1 genus, 2 species, 3 taxa.
- No species threatened; none extinct since 1600.

Systematics

The name Buphaginae, as a subfamily within the starling family (Sturnidae), was introduced by the French ornithologist R. P. Lesson in 1828. This placement of the oxpeckers was followed by G. R. Gray, R. B. Sharpe and A. Reichenow, whereas W. L. Sclater placed the starlings and the oxpeckers in a single family without further comment. Subsequently, D. Amadon noted that the oxpeckers were so aberrant that their membership of the Sturnidae was questionable, and he cited only "the wing structure and other morphological resemblances, the harsh, unpleasant calls, and the habit of nesting in holes of trees" as characters common to the two groups; these features, however, clearly do not constitute strong evidence of a relationship in a phylogenetic sense. Amadon later suggested merely that they were "probably of common ancestry with other starlings", and in 1962, in J. L. Peters's *Check-list of Birds of the World*, he retained them as a subfamily of the starlings. Almost 20 years later, H. E. Wolters, in his treatment of the Sturnidae, placed the two *Buphagus* species first, followed by the monotypic Asian starling genus *Scissirostrum*, implying a primitive position within the family, but not in a separate subfamily. The melanin granules in the feathers were found, on microscopic investigation, to be round and solid, typical of the presumed "primitive" condition shared with many starling species, but also with other birds. The karyotype of the Red-billed Oxpecker (*Buphagus erythrorhynchus*) resembled that of several *Sturnus* species, but no detailed comparisons were made with members of other bird families. C. G. Sibley and J. E. Ahlquist, in their phylogenetic analyses based on DNA–DNA hybridization, did not include *Buphagus* among the species that they examined, and Sibley and B. L. Monroe, in their 1990 checklist, placed the oxpeckers closest to the genus *Scissirostrum* in the tribe Sturnini, evidently influenced by morphological similarities.

Some authors, such as P. A. Clancey, have preferred to recognize a separate family, Buphagidae, and this decision, published in Clancey's 1980 checklist of southern African birds, was followed by most southern African authors until the most recent revision of *Roberts Birds of Southern Africa*, in 2005, which incorporated *Buphagus* in the Sturnidae. For the rest of Africa, the oxpeckers were generally retained in the family Sturnidae following the checklist for East Africa, by P. L. Britton, and the Afrotropical list of R. J. Dowsett and A. D. Forbes-Watson; and C. J. Feare and A. J. F. K. Craig included the two oxpecker species in their monograph of the starling family, a decision based on a preliminary phylogeny of the African genera that utilized the available morphological and biological characters. Nevertheless, volume VI of the major avifauna *The Birds of Africa*, published in 2000, accorded the oxpeckers full family rank, as the Buphagidae. No new data were produced in support of any of these decisions.

Three independent molecular phylogenies have now placed the oxpeckers as basal to a group which includes the mockingbirds (Mimidae) and the starlings. The consensus view is to assign separate family rank to each of the three groups. A tentative date for the divergence of the Buphagidae, based on a molecular clock, is 22 million years ago, but there are at present no known fossils which could provide independent confirmation of the age



Oxpeckers spend most of the day perched on large mammals. The arrangement of their leg muscles resembles that of starlings (Sturnidae), the only differences affecting muscles that increase the grasping power of the feet. The bill of the ***Red-billed Oxpecker*** *is laterally flattened and slightly bulbous towards the centre, and is bright red in the adult. That of the Yellow-billed Oxpecker* (Buphagus africanus) *is laterally flattened and bulbous towards the tip; the basal part of the bill is yellow, and the distal portion red. Nestlings of both species have a greenish-yellow bill, which changes to dark brown when they fledge. Adult bill colour is acquired at about seven months in the Red-billed Oxpecker.*

[*Buphagus erythrorhynchus*, Samburu National Park, Kenya. Photo: Theodoulos Poullis]

of the group. The two extant species are clearly sister-taxa, and hybrids between them have been reported from Zimbabwe in free-living populations in which one species greatly outnumbers the other. As with many other African birds, a plethora of subspecific taxa has been described, the great majority based on minor differences in size and plumage; most of these differences seem not to be biologically informative in terms of defining populations between which there is reduced gene flow.

Thus, the common ancestor of the oxpeckers and the starlings would have shown some of the morphological traits described above, which have been cited previously as evidence of relationship. In cladistic terms, however, these are shared primitive characters, and thus uninformative in comparison with derived features. In Africa, the savanna habitat has been the centre of evolution for a number of bird families, and also for the ungulates, so that there would have been a long association between the birds and the mammals. Several modern starlings include ectoparasites in their diet, and have been seen to remove ticks (Ixodoidea) from both domestic and wild ungulates. In the case of the Red-winged Starling (*Onychognathus morio*) and the Pale-winged Starling (*Onychognathus nabouroup*), a regular grooming association with the klipspringer (*Oreotragus oreotragus*) has been noted at several localities in Africa (see page 681). Dietary specialists could well have evolved from such opportunistic generalists.

Morphological Aspects

The plumage of oxpeckers is dull, lacking any of the iridescence displayed by the starlings, and there is no sexual dimorphism in coloration. Males of both species are, on average, slightly larger than the females, although considerable overlap in measurements exists. The tail is graduated, with the individual rectrices stiff and pointed, and it is used as a prop to support the bird in the posture of a woodpecker (Picidae) on a tree trunk. Indeed, an observer at a Red-billed Oxpecker nest in a tree-hole reported that, when one young left the nest prematurely and fluttered to the ground below, the adults led it back to the nest by running up the trunk in a manner reminiscent of a woodpecker. The moult is very protracted, the Red-billed Oxpecker taking more than 300 days to replace the primary remiges in South Africa. As a consequence, some overlap between breeding activity and moulting will occur, although, with such a slow rate of moult, this is unlikely to be stressful for the birds. On the evidence of museum specimens, an extended moult period is likely to be typical for all populations of both oxpecker species.

Although the two species differ in bill shape, the Yellow-billed Oxpecker (*Buphagus africanus*) having a flatter and deeper lower mandible than that of its congener, there is no clear evidence that this is associated with different feeding methods. Nestlings of both species have a greenish-yellow bill colour, which changes to dark brown when they fledge, and they have a yellow wattle around the eye, which darkens to dull brown in the immature. In the case of the Red-billed Oxpecker, the eye wattle changes again, to yellow, in the adult, although this is not so with the Yellow-billed Oxpecker. Juveniles younger than 60 days of age still have a yellow bill, while the bill of the young Red-billed Oxpecker becomes dark brown from about 60–120 days. Adult bill colour is acquired at about seven months by the Red-billed Oxpecker, and certainly within the first year of life by the Yellow-billed Oxpecker. Further, juveniles have a dark brown iris, which, in the case of the Red-billed Oxpecker, starts to turn yellow at about four months and changes to yellowish-red by the time the birds are 6–7 months old. The timing of this iris-colour change has not been recorded for the other species, and the pigments or tissue structures responsible for the eye coloration have not been described. The possible signal value of these changes in eye and bill colours has yet to be studied. J. P. Chapin reported that the eye colour of a captive oxpecker varied, and he speculated that it might be dependent on blood flow, in which case spontaneous changes in the intensity of eye coloration would be possible. Bird-ringers have reported and photographed dramatic changes in iris colour from red to yellow and back again, sometimes affecting the eye on one side only. In the Yellow-billed Oxpecker the iris has a narrow yellow inner ring, a broad red band, and a very narrow outer yellow ring; here too, shifts in iris colour from yellow to orange and red have been noted in birds in the hand. This strongly suggests that under natural conditions also, changes in eye coloration may accompany behavioural interactions between the birds, and observers should be alert to this in the field.

P. R. Lowe commented that his dissection of the jaw musculature of *Buphagus* suggested that the latter was a starling in the broad sense, but that the maxillo-palatine and vomer bones in the



Both species of oxpecker have dull plumage, with none of the iridescence of the starlings. Sexes are alike. Juveniles of both species have plumage like adults, and yellow wattles round the eye, which darken to dull brown in the immature. In the ***Yellow-billed Oxpecker****, the wattle remains brown, but in the Red-billed Oxpecker* (Buphagus erythrorhynchus) *it changes again to yellow in the adult. Three independent molecular phylogenies have placed the oxpeckers as basal to a group which includes the mockingbirds (Mimidae) and starlings. The consensus is to assign family rank to each of the three groups. The Buphagidae may have diverged around 22 million years ago, but this is based on a molecular clock.*

[*Buphagus africanus africanus*, Serengeti National Park, Tanzania. Photo: Konrad Wothe]



*The **Red-billed Oxpecker** forages in small groups, and up to 15–20 individuals have been seen on a single giraffe* (Giraffa camelopardalis). *Sometimes both species of oxpecker are found feeding on the same host mammal. In the evening, Red-billed Oxpeckers fly off to roost in trees or reedbeds, in small groups, or in large flocks made up of birds from a wider area. Similar behaviour has been reported for Yellow-billed Oxpeckers* (Buphagus africanus) *in Nigeria, although elsewhere this species has been observed sleeping while perched on its host mammal.*

[*Buphagus erythrorhynchus*, Nylsvlei Nature Reserve, South Africa. Photo: Hugh Chittenden]

skull differed sufficiently from those of other starlings to imply that it should be placed in a separate subfamily. W. J. Beecher also examined the jaw muscles of the starlings, and noted that, in the Red-billed Oxpecker, both the protractor of the quadrate and the pterygoid and palatine muscles were enlarged, a development typical of the woodpeckers and apparently associated with the buffering of the brain against the shocks resulting from blows delivered by the bill. In other respects, he found the jaw musculature to be similar to that of the primitive starling condition, as opposed to the derived state found in those starling species that are specialized for probing.

Oxpeckers spend most of the day perched on the top or side of large mammals (see General Habits), and the leg musculature reflects this. Studies of the hind-limb musculature of the oxpeckers showed that the basic arrangement of the leg muscles resembled that of true starlings, the only differences affecting muscles which increased the grasping power of the feet. The legs are relatively short compared with those of either perching or ground-dwelling birds of similar body weight. The claws of oxpeckers exhibit the structure and curvature typical of climbing birds such as woodpeckers, treecreepers (Certhiidae) and nuthatches (Sittidae), whereas the Common Starling (*Sturnus vulgaris*) has the claws of a typical perching bird. In contrast to members of the starling family, the oxpeckers' hind claw is shorter than the claw on the middle toe, the reverse of the pattern found in perching birds. Oxpeckers also have a very fine constricted tip on the claws, which may be an adaptation for penetrating the substrate at the tip while maintaining claw strength along the rest of its length. One collector commented that, if a freshly killed oxpecker was placed on the skin of an ox, the feet and claws immediately grasped the substrate, and it was difficult to disengage them.

Habitat

Both members of this family are savanna species, being absent from deserts and from closed evergreen forest. Their habitat choice, however, is further constrained by preferences for particular host mammals, and for the main tick species on which they feed. The favoured ticks are limited by humidity, and evidently cannot survive in some open grassland or scrub habitats; these regions would also lack suitable nesting sites for the oxpeckers. In South Africa, C. J. Stutterheim showed that the historical records of the Red-billed Oxpecker coincided closely with the distribution of the two commonest tick species, namely *Boophilus decoloratus* and *Rhipicephalus appendiculatus*, recorded in the stomach contents of wild birds, and favoured in feeding trials with two captive individuals. Both of these tick species, however, extended into the winter-rainfall region of the southern coast, whereas the western limit for the Red-billed Oxpecker was at the boundary of the summer-rainfall region.

The Yellow-billed Oxpecker, too, feeds extensively on *R. appendiculatus*, with ticks of the genus *Amblyomma* apparently its second choice. The ticks are again a good predictor of this oxpecker's distribution in north-eastern South Africa, but this buphagid seems never to have occurred so far south as its congener. For other regions of Africa, data on tick distribution are too incomplete for any correlation with the distribution of the birds to be assessed. Through much of eastern Africa the two species are extensively sympatric, and there is no obvious separation between them in habitat selection; both have been recorded at up to 3000 m in Kenya, with some indication that Yellow-billed Oxpeckers are more often found above 1000 m and Red-billed Oxpeckers at lower altitudes.

Considerable overlap in host choice between the two oxpecker species is evident, and the two can sometimes be seen side by side on the same mammal. There have been no systematic observations of their interactions in this situation, although there is little indication that either of the two buphagid species is influenced in its choice of host animal by the presence of the other species. Under captive conditions, Yellow-billed Oxpeckers were constantly dominant over Red-billed Oxpeckers, although there were relatively few direct confrontations. Some mammal species appear to be avoided. African elephants (*Loxodonta africana*) do not tolerate oxpeckers and quickly chase them off. A few reports from Zimbabwe of oxpeckers on elephants were during a severe drought, when the elephants were in very poor physical condition and appeared totally indifferent to the presence of the birds.



The vocalizations for which both oxpecker species are most renowned are their alarm calls, and indeed no song has been described for the ***Yellow-billed Oxpecker****. The hissing "kriss kriss" of this species alerts its hosts to potential threats. This call, and the buzzing flight call, are the diagnostic vocalizations for observers in the field. In the early twentieth century, observers reported that oxpeckers seemed disconcerted by the failure of domestic cattle to react to their alarm calls. Forty years later, their behaviour had changed: the birds moved to the sides of cattle furthest from the approaching human, but did not give alarm calls, although not far away, oxpeckers on wild game immediately gave alarm calls when approached.*

[*Buphagus africanus africanus*, Masai Mara National Park, Kenya. Photo: AGE/ www.photolibrary.com]

It has been suggested by several observers that elephants are sensitive to the sharp claws of oxpeckers, one ornithologist describing them as being thin-skinned animals with a trunk. On the other hand, through much of western Africa, elephants are commonly seen with Piapiacs (*Ptilostomus afer*), a corvid having much blunter claws and a different foot structure, perched on them. Bushbucks (*Tragelaphus scriptus*) and common waterbucks (*Kobus ellipsyprimnus*) have been seen actively to dislodge oxpeckers which landed on them; lechwe (*Kobus leche*) and puku (*Kobus vardonii*) are not exploited by the birds, nor are southern reedbucks (*Redunca arundinum*). The impala (*Aepyceros melampus*) seems to be the only smaller antelope regularly patronized by oxpeckers, whereas there are no reports for any of the duikers (Cephalophinae). This may be explained by the fact that impalas are found in bushy habitat, which leads to a high load of immature ticks; and live in a herd structure, which provides a number of individual hosts close together. In Zambia, the large-bodied Lichtenstein's hartebeest (*Alcelaphus lichtensteinii*) seemed to be avoided by oxpeckers, although it was reported as a host for Yellow-billed Oxpeckers in Mali, while the tsessebe, or topi (*Damaliscus lunatus*), is also utilized much less frequently than would be expected.

Many observers have provided lists of the host mammals on which oxpeckers have been sighted. In current national parks these may often be biased by the availability and relative abundance of particular game species, and this may account for some of the apparent regional differences observed. Nevertheless, there is a general consensus concerning the ungulates which are utilized most frequently under natural conditions. These are the African buffalo (*Syncerus caffer*), white rhinoceros (*Ceratotherium simum*), black rhinoceros (*Diceros bicornis*), giraffe (*Giraffa camelopardalis*), hippopotamus (*Hippopotamus amphibius*), greater kudu (*Tragelaphus strepsiceros*), eland (*Taurotragus oryx*), roan antelope (*Hippotragus equinus*), sable antelope (*Hippotragus niger*), Burchell's zebra (*Equus burchellii*), blue wildebeest (*Connochaetes taurinus*), impala, and warthog (*Phacochoerus aethiopicus*).

Cattle arrived in North Africa at least 8000 years ago, and there were certainly herds of domestic animals north of the equator for thousands of years, although the herdsmen are thought to have moved southwards only some 2500 years ago, reaching the current southern limit of the oxpeckers' distribution about 2000 years before the present. Today, cattle are the primary hosts of oxpeckers in many regions. G. F. Archer noted that oxpeckers were rare in Somalia not only because of the general absence of wild ungulate hosts, but also because of the widespread replacement of cattle and donkeys by camels (*Camelus*), which were evidently not favoured by the buphagids. Single-humped domesticated camels, known as dromedaries (*Camelus dromedarius*), are thought to have reached Africa from Asia only within the last 1000 years. Nevertheless, some observers do report instances of oxpeckers feeding from camels. Horses will usually not tolerate oxpeckers according to some observers, but others have reported these birds perching on horses, often feeding at wounds, as well as on donkeys and mules. Oxpeckers occasionally perch on goats or sheep, and sometimes on domestic pigs.

General Habits

Since oxpeckers spend most of their days perched on the host mammals, relatively few activities take place away from the host. Nevertheless, oxpeckers have been observed to dust-bathe, as well as indulging in conventional bathing in water. The birds will leave their mammalian hosts briefly and fly to water-holes in order to drink or bathe, but more often they are passengers when the mammals go to drink. Sometimes the oxpeckers simply run down the animal's leg to reach the water, and take a few sips without actually "detaching" themselves from the mammal. After bathing, they preen the wet plumage while perched on the host. In addition, captive Red-billed Oxpeckers adopted typical sun-bathing postures while perched on a wall within their enclosure, and they were also photographed while sunning, with the wings and tail spread out, on the back of a rhinoceros.

When moving about on the host mammal, oxpeckers generally hop, moving both hind limbs simultaneously, but when stalking flies or during courtship they will also "walk", moving the limbs alternately. They seem invariably to hold the head up, and

they move forwards or sideways and even backwards, but seldom hang suspended underneath the animal. When defecating, oxpeckers lean forward, raise the tail, and generally spray the excrement well away from the host's body.

Throughout their range, Red-billed Oxpeckers leave the host animals in the evening and fly off, as small groups, or as large flocks from several sites, to roost in trees or reedbeds. These roost-sites may be shared with *Lamprotornis* starlings, and in some areas even buildings are used for roosting. Similar behaviour has been reported for Yellow-billed Oxpeckers in Nigeria, where the birds roosted in trees, but in Zambia this species was seen to sleep on buffaloes at night, in Zimbabwe observers reported the oxpeckers sleeping while perched on kudus, elands and sable antelopes, and in Uganda a group was found to be sleeping on a giraffe; in Kenya, birds were seen on elands and giraffes at night. There is a report from Zambia of Red-billed Oxpeckers on buffaloes at night. How widespread this behaviour is remains unclear, and it is not known which local conditions may determine the birds' choice of sleeping place.

Molecular techniques were employed in order to determine the sex of Red-billed Oxpeckers in Zimbabwe. The results revealed that the sex ratio among regular group-members was balanced, but that the composition of non-breeding social groups was quite fluid over time. Although the overall sex ratio was 52 males to 108 females, this appeared to be an artefact of the restricted sampling area and the apparent greater mobility of females in all age-classes.

Voice

Oxpeckers hardly rate a mention as songsters, and the vocalizations that have attracted most attention are the alarm calls given while the oxpeckers are perched on their mammalian hosts, and the flight calls emitted by the birds when startled or on their way to or from roost-sites. These are the diagnostic calls for human observers in the field. W. Neweklowsky, however, described two song types for the Red-billed Oxpecker in the Zurich Zoo, in Switzerland. One consisted of a string of soft calls, interspersed with trills and whistles, which were uttered by both male and female of a pair when they were temporarily separated; and the second type was a series of drawn-out whistling notes used in courtship, and seemingly given by the male alone. The full repertoire of oxpecker vocalizations is most likely to be uncovered through monitoring of individuals in captivity, where a close approach is possible, and both birds and host animals are habituated to the presence of humans.

Currently, more attention is being paid to the songs produced by female birds, and it is evident that, with many passerine species, the females do sing, often in the same contexts of territorial defence or courtship as those which elicit song from the males. Future studies of oxpecker vocalizations should, therefore, focus on individually marked birds of known sex.

Food and Feeding

The main food item of the Buphagidae is ticks, with a clear preference apparent for particular species and also for certain stages in the ticks' life-cycle. The Red-billed Oxpecker, especially, feeds primarily on the immature stages of ticks. Lice (Anoplura), fly larvae (Diptera) and leeches (Hirudinea) are also removed from the host's body surface, while flying insects such as dipterans, particularly horseflies (Tabanidae) and blackflies (Simuliidae), are caught in the air. As engorged ticks are in essence small bags of blood, the oxpeckers will also feed directly on blood from wounds, and sometimes on other body fluids such as mucus from the nose or eyes, and even on ear wax, which would seem to have little nutritive value. There seem not to be any major differences in food preferences between the two species, except that, on the basis of comparative studies of a small number of captive individuals, Yellow-billed Oxpeckers may catch more biting insects and take larger ticks, such as engorged females of *Amblyomma hebraeum*, than do Red-billed Oxpeckers.

Oxpeckers remove ectoparasites from their mammalian hosts by two different techniques. One of these involves simple pecking and plucking with the tip of the bill, whereas in the other method, known as "scissoring", the bill is laid sideways against



The main food of both oxpecker species is ticks. There are no major differences in preferred prey between the two species, though on the basis of studies of captive birds, ***Yellow-billed Oxpeckers*** *may take more biting insects and larger ticks, such as engorged females, while Red-billed Oxpeckers* (Buphagus erythrorhynchus) *feed primarily on the immature stages of ticks. Oxpeckers use two techniques to detach ticks from their hosts. The first involves pecking and plucking with the tip of the bill after prey has been located visually. In the second, known as scissoring, the bill is laid alongside the host's skin, and opened and closed; prey is detected by touch. Scissoring is used most often on long-haired hosts such as greater kudu* (Tragelaphus strepsiceros).

[*Buphagus africanus africanus*, Tanzania. Photo: Eyal Bartov]



*One **Red-billed Oxpecker** was found to have 1665 ticks in its stomach. In captivity, oxpeckers have been recorded eating up to 12,000 tick larvae, or 100 adult ticks per day. Although ticks are the main food type, oxpeckers will also eat leeches, lice, biting flies such as horseflies, and alate termites. They stalk flying insects when these settle on the host, and will also hawk them in the air. Other food includes blood, and mucus obtained from the eyes and nostrils of host mammals. In natural habitats, Red-billed Oxpeckers are found chiefly on giraffes, African buffaloes, both African species of rhinoceros, zebras and several species of antelope; other hosts include hippopotamuses, as here, and warthogs.*

[*Buphagus erythrorhynchus*, Serengeti National Park, Tanzania. Photo: Ketil Knudsen]

the skin and is then opened and closed, as with a pair of scissors. The former approach depends on visual location of the prey, while in the latter technique the prey is detected by touch. The feeding style utilized is correlated with the hair structure of the host, with scissoring not employed on nearly hairless animals, such as rhinoceroses or hippopotamuses, except at wounds or when collecting mucus at the nasal openings. The highest frequency of scissoring is observed when the buphagid is on the longest-haired hosts, such as the kudu and the roan and sable antelopes. The head and ear regions are in many cases the areas where the birds spend the majority of their foraging time, and regular hosts are often most accommodating in allowing what appears to the human observer to be an uncomfortable and invasive process. Studies of the impala's interactions with oxpeckers indicate that the antelope grooms less often when visited by the birds, suggesting that it does benefit from the association. In this case, the oxpeckers clearly focus their attention on areas which the impalas are not able to reach effectively by themselves, and where the highest concentrations of ticks are likely to be found.

Two of the common tick prey species, *Amblyomma hebraeum* and *Boophilus decoloratus*, have also been recorded as ectoparasites of both adult and nestling Red-billed Oxpeckers. Since these ticks were found much more frequently on the nestlings, it is possible that they represent live food which had escaped after having been brought to the nest. The other ectoparasites noted, two mites (Acarina) and a feather louse (Mallophaga), are specific to the birds in question and would not have been acquired from their mammalian hosts.

As already noted, oxpeckers often feed at wounds. This behaviour, when directed at the black rhinoceros, is commonly associated with the skin lesions infested with filariid parasites, which are found in this species but not in the white rhinoceros. The possible role of the oxpeckers in delaying the healing of such wounds or in the transmission of the parasites has yet to be clarified, but a research project is currently in progress. Hippopotamuses frequently have wounds resulting from intraspecific fighting, and these are favoured feeding sites for buphagids. Several observers have reported that the birds, as well as taking blood, will remove fragments of tissue from the wounds. There are also observations of oxpeckers feeding on carrion, including the dressed carcases of animals. Oxpeckers held in captivity are routinely maintained on a diet in which the main component is raw minced meat. Despite the implication that oxpeckers may actively feed on the flesh of their hosts, this may be exceptional under natural conditions. Observations on captive rhinoceroses suggested that abrasions healed despite the attentions of the birds. A tame oxpecker fed eagerly on blood from a cut in a human finger, nibbling at the area in order to increase blood flow, but apparently not causing any further damage.

During the translocation of Red-billed Oxpeckers in South Africa, the captured birds were initially held in bomas (livestock enclosures), with donkeys as hosts. This led to problems when the birds opened wounds on the donkeys, such that the latter had to be changed on a regular rotational basis. A simple solution proved to be that of feeding the oxpeckers directly with blood, which was collected from a culled animal and treated with an anticoagulant, along with lean minced meat to which vitamin and mineral supplements had been added. Buphagids on this diet often gained weight during the quarantine period before being released at a new locality, and it was found to be unnecessary to enclose a mammalian "host" with them.

Breeding

At least in the Kruger National Park, in South Africa, the breeding season is closely linked to rainfall, which influences both the grazing activity of the ungulates and the prevalence of ticks. Courtship and copulation take place on the host animal, further illustrating the closeness of the association of these birds with large mammals. In observations of captive birds, the selection of the nest-site appeared to be determined by the male.

The two species of oxpecker normally nest in tree holes, although they have been reported as using other sites, including holes in walls, and J. Vincent even found a nest at the base of a cleft in a large boulder. The cavity is lined with dry grass, and often with the addition of hair plucked from the host mammals; in farming areas this can include wool from sheep (*Ovis*), which the birds seemed to visit for this purpose only. Dung and rootlets may also be added to the interior.

Both members of the family lay clutches of two or three eggs, the Red-billed Oxpecker sometimes laying up to five. Its eggs have a white to creamy, or occasionally very pale blue or pale pink, ground colour heavily speckled with reddish-brown and lilac-grey, or sometimes with pink and maroon speckles on grey and lavender blotches; they measure 22·5–26·5 × 15·8–18·6 mm. Yellow-billed Oxpeckers' eggs are similar, but the speckling is sometimes less heavy or even lacking altogether, and a small sample had dimensions of 23·4–26·6 × 16·6–18 mm. For both species, the incubation period is approximately 13 days. The nestling period of the Red-billed Oxpecker is 27–30 days, whereas that of its less well-known congener appears to be about 25 days.

In captivity, male and female Red-billed Oxpeckers shared incubation duties, and it is likely that this applies to both species under natural conditions. Similarly, the feeding of the young is a joint venture. As with most passerine birds, brood patches develop only on the females.

Co-operative breeding is a regular feature of the social organization of oxpeckers, most helpers apparently being older siblings of the nestlings. In one captive group, other, unrelated adults also assisted in the feeding of the young. Helpers sometimes contribute nesting material during the nest-building stage, but their primary role is that of feeding the young, both nestlings and fledglings.



*Cattle and donkeys are now the primary host species of the **Yellow-billed Oxpecker** in many parts of West Africa and indeed elsewhere. Oxpeckers have been condemned as pests for inflicting injuries on livestock, preventing wounds healing, and even causing the deaths of already-weakened donkeys. On the other hand, traditional cattle herders, especially in areas with tick-borne diseases, often regard oxpeckers favourably, and may have prohibitions against harming them.*

[*Buphagus africanus africanus*,
Faraba Banta Bush Track, Gambia.
Photo: Ian Fisher]

Movements

The principal hosts of the oxpeckers do not undertake long-distance migrations, and the birds are not, therefore, obliged to follow migratory herds of game. Red-billed Oxpeckers do make regular flights each night to roost-sites in reedbeds or trees, but colour-marked individuals which were tracked visually in the Kruger National Park, in South Africa, moved less than 10 km from the capture site, and two individuals had circular home ranges calculated at about 27 km² over a nine-month period. This is likely to be typical in areas with dense game populations and permanent water supplies, but where the game undertake significant seasonal movements one could expect that the oxpeckers would follow. There is one record from Zambia of a Red-billed Oxpecker found 64 km from the ringing site after 16 months, and some



*Oxpeckers have been observed eating carrion, and these **Yellow-billed Oxpeckers** may be feeding on the flesh and blood of this dead hippopotamus* (Hippopotamus amphibius). *The wounds sustained by hippos during their frequent bouts of intraspecific fighting are favourite feeding sites for oxpeckers. Oxpeckers wound-opening and pecking for ticks, especially around sensitive parts like the ears, may be an uncomfortable experience for the host. Some species, including elephants* (Loxodonta), *reject the attentions of oxpeckers, and even individuals of regular host species may attempt to dislodge them.*

[*Buphagus africanus africanus*,
Chobe National Park, Namibia.
Photo: Clem Haagner/ Ardea]



*These **Yellow-billed Oxpeckers** have left their host mammals temporarily, in order to drink at this water-hole. Oxpeckers commonly remain aboard when the mammal goes to drink, sometimes running down its leg and taking a few sips of the water without actually detaching themselves from their host. Oxpeckers have been observed leaving their hosts in order to dust-bathe, or to bathe in water. After bathing, they return to perch on the host mammal while they preen their plumage. In Senegal, there are reports that Yellow-billed Oxpeckers will drink fresh cow's milk from containers when these are unattended by the herdsmen.*

[*Buphagus africanus africanus*, Botswana. Photo: Konrad Wothe]

individuals appeared to have moved up to 50 km from the point of release within a year of their reintroduction to reserves in Zimbabwe. Since Yellow-billed Oxpeckers may sleep while perched on the host animals (see General Habits), they could be passively carried by herds of buffaloes, which will occasionally travel up to 8 km in a day.

Despite these indications that oxpeckers are largely sedentary, there are some ringing records which suggest long-distance dispersal or vagrancy. A translocated Red-billed Oxpecker in South Africa returned to the site where it had been captured, 170 km away, and another was found 87 km from the release site. Still in South Africa, prior to the reintroduction of Red-billed Oxpeckers in the Eastern Cape, a single individual was reported from Cape Recife Nature Reserve, near Port Elizabeth, in 1960, and two were sighted on cattle near Kenton-on-sea in 1989. No escapes from captivity had been reported, and the nearest wild populations at that time were more than 1000 km away. There have been no studies of the dispersal of buphagids, nor of any interchange between different groups, but among co-operative breeders such as the oxpeckers the young birds generally leave the natal group in order to attain breeding status. The apparent female-biased sex ratio found in Red-billed Oxpecker groups in a study in Zimbabwe (see General Habits) strongly suggests that females are the dispersing sex, and that, when a breeding female is lost from a group, she is replaced by one of the "floaters" which associate temporarily with different social units. In this study, lone individuals which were resighted after having been ringed, and having had their sex determined, were more likely to be female than to be male.

Relationship with Man

For our hunting forebears, oxpeckers would have been simply a nuisance, since they must often have alerted grazing animals to the approach of human hunters, especially before man had developed weapons which could kill at an appreciable distance. Later, hunters with rifles still found that the birds regularly alerted the quarry to the approach of a human. The nineteenth-century natural-history collector J. A. Wahlberg noted in his journals two occasions on which rhinos escaped his sights after oxpeckers gave the alarm, while on two other rhino hunts the call of an oxpecker first alerted him to the probable presence of the mammals. Wahlberg's contemporary and sometime travelling companion A. Delegorgue wrote of oxpeckers warning buffaloes and elands, as well as rhinoceroses, and commented that, as a hunter, he had cursed the oxpeckers more than he had any other birds. A. R. Maclatchy, a twentieth-century hunter of big game in Gabon, credited the oxpeckers with bringing to his attention the position of a wounded buffalo before the concealed animal charged him, and he considered them a help, rather than a hindrance. He noted also, incidentally, that these birds would return to a wounded buffalo, or even to a freshly killed one.

Conflicting views were evident with regard to the nature of the relationship between oxpeckers and domestic livestock. At the start of the twentieth century, T. Ayres, a transport rider in South Africa, stated that the birds dug large holes in the backs of transport oxen and fully merited their name of "buphaga", which means "ox-eater". Later, A. Vincent noted that, in his experience, oxpeckers within a herd of cattle were seen most often on the bulls, which were probably dipped less often and therefore carried a heavier tick burden. W. L. Sclater and R. E. Moreau wrote that, in Tanzania, oxpeckers were "credited with performing services of the utmost value in cleaning cattle of ticks, and they have been heartily damned for making, and keeping open, wounds". These authors commented that local people had a generally favourable opinion of the birds, whereas European stock-owners considered them a pest. Moreau examined the stomach contents of 58 Red-billed Oxpeckers from Tanzania, and found 2291 ticks in 55 of the birds; one stomach was empty, and two others contained only Diptera. He concluded that the birds were probably beneficial to healthy cattle exposed to ticks, and suggested that stock in poor physical condition were the most likely to suffer damage. V. D. van Someren came to a similar conclusion on the basis of a questionnaire distributed to European farmers in Kenya after the dipping of cattle had become a regular practice. R. E. Cheesman and Sclater described the Red-billed Oxpecker in Ethiopia as "A bird of evil habits, a mule with a saddle gall has little chance of healing, as these birds keep the wound open daily by pecking the live flesh and drinking the blood, and will pick holes for themselves in the skin of a weak or sick donkey." F. J. Jackson, writing of Red-billed Oxpeckers in Uganda, balanced

their positive services to cattle and big game against the damage caused to pack-donkeys and mules "in the old caravan days", and claimed that many donkeys died through the aggravation of sores by the oxpeckers. Once again, the damage was associated with existing injuries and poor condition of the animals. Some 40 years later, however, Y. A. Mengesha stated that oxpeckers in Ethiopia visited animals with sores more often than they did those with ticks, and he observed the birds as they opened wounds on a cow which had no existing skin lesions. According to his informants, many cattle-owners in the region considered the birds to be pests, and took special measures to keep them off the stock. Some traditional cattle-herders still regard the buphagids more favourably in a region with many tick-borne diseases which affected domestic stock prior to the advent of veterinary services. Even in the twenty-first century, in the Mbulu highlands of Tanzania, there was a social prohibition against the harming of oxpeckers, since these birds' important role in reducing the numbers of ticks was familiar to the community.

Studies undertaken by P. Weeks in Zimbabwe suggested that the relationship between Red-billed Oxpeckers and cattle in this region was not beneficial to the cattle, since "wound-feeding" by the oxpeckers was rife, and there was no detectable increase in tick loads on cattle from which the birds had been experimentally excluded. He noted also, however, that cattle are not the hosts with which the birds have co-evolved, and that their relationship with wild game may represent a genuine symbiosis. Observations of captive oxpeckers and black rhinoceroses at Zurich Zoo, in Switzerland, demonstrated that the birds did open new wounds on their hosts, and that the rhinos were intolerant of the birds feeding at wounds and regularly attempted to dislodge them. This was an unnatural situation, especially since the captive rhinos were tick-free, but it suggests that field studies of oxpeckers should focus on the frequency of feeding at wounds, and monitor the frequency with which new wounds are created on game animals.

Although Reichenow quoted South African observers who reported that oxpeckers on cattle flew up when people approached, and were apparently disconcerted at the animals' failure to react to the birds' alarm calls, both Jackson and Archer noted in eastern Africa, some 30–40 years later, how different the oxpeckers' behaviour was when the birds were exploiting domestic stock. In the latter situation, they always moved swiftly to the other side of the animal, away from the human observer, but did not fly up or give alarm calls. Yet within a few kilometres of the cattle herds, oxpeckers on wild game immediately gave alarm calls when people approached. Do oxpeckers foraging on cattle learn to imitate the mammals' indifference to the presence of herdsmen and, as a consequence, stop responding? Do these birds still alternate between foraging on wild animals and exploiting domestic animals, or are there "specialist" populations which favour one host category above the other? At this stage, we have no clear answers to these questions.

Status and Conservation

In both southern and eastern Africa, the reduction in size of the herds of wild game, and in particular the displacement of the rhinoceros and buffalo, have removed favoured oxpecker hosts. Game control, a euphemism for large-scale attempts to eradicate wild animals from areas selected for stock-farming, was frequently linked to campaigns to eliminate the tsetse fly (*Glossina*), the insect vector of trypanosome parasites which killed the imported animals but left the indigenous wildlife unaffected. Although domestic cattle are acceptable replacement hosts for the oxpeckers, rinderpest epidemics at the end of the nineteenth century seriously reduced the populations of both cattle and buffaloes. Soon after this, a regular animal-dipping regime was introduced in many farming areas in an effort to reduce stock losses from tick-borne diseases. Not only were tick populations greatly reduced by dipping, but the early arsenical dips were highly toxic to the birds, and this led to the rapid disappearance of oxpeckers from areas under the influence of European colonists.

Thus, whereas C. Belcher had reported pre-1920 observations indicating that Yellow-billed Oxpeckers were common on cattle at Chiromo, in Malawi, this buphagid had virtually disappeared from the country when C. W. Benson reviewed the Malawi avifauna, in 1977, and according to the most recent atlas data it is now confined to two game reserves. The Red-billed Oxpecker, too, is virtually restricted to protected areas with wild ungulates, and in the past 50 years there have been only two reports of this species on cattle in Malawi. Commercial farmers in the Makonde district of Zimbabwe noted the return of Red-billed Oxpeckers



Both oxpecker species nest in tree holes, although they have been reported using other sites such as clefts in rocks and walls, and even holes in buildings. The ***Yellow-billed Oxpecker*** *chooses a site two to seven metres above ground, and lines the cavity with hair plucked from host animals, dry grass, and sometimes feathers. In at least part of the range, the oxpecker breeding season is linked to rainfall, which influences the grazing activities of host mammals, and the abundance of ticks. Courtship and copulation take place on the back of the host mammal. Both species generally lay two or three eggs.*

[*Buphagus africanus africanus*,
South Africa.
Photo: Clem Haagner/
Ardea]

to the area some 50 years after they had last been reported in the district. This was apparently associated with the cessation of tsetse-fly control programmes, which had involved both elimination of wild game and pesticide-spraying, followed by the re-establishment of game on many properties.

When C. J. Stutterheim reviewed the historical distribution of oxpeckers in South Africa, he concluded that the Red-billed Oxpecker had disappeared from the southern part of its range in the Eastern Cape province coincidentally with the widespread introduction of cattle-dipping early in the twentieth century, while it survived in the north-east of the country primarily in game reserves or in tribal lands, where cattle were not dipped regularly. The Yellow-billed Oxpecker seems always to have been less common in the region, and was restricted to the north-eastern sector. It was considered extinct in South Africa by 1965, and may have disappeared as a breeding species much earlier than that. In 1979, however, Yellow-billed Oxpeckers reappeared in the Kruger National Park, in the north-east part of South Africa, where there had been no confirmed records of the species since 1896, and juveniles were sighted in 1984. This oxpecker had evidently colonized the area from north of the Limpopo River, which forms the northern boundary of the park, since there were still Yellow-billed Oxpecker populations in southern Zimbabwe. It was suggested that the breakdown in the regular dipping of cattle and in control over the movements of both cattle and game during the later phases of the war in Zimbabwe facilitated the dispersal of these birds through this region. In 2000, the number of Red-billed Oxpeckers in the Kruger National Park was estimated at more than 32,000 individuals, whereas the estimated population of Yellow-billed Oxpeckers in the park was about 500. The latter species clearly remains an uncommon bird there.

The first attempts at reintroducing oxpeckers in areas from which they had been extirpated were made in Zimbabwe. In 1962, after heavy tick loads had been noted on newly established wild game in McIlwaine National Park, oxpeckers of both species were captured in Hwange National Park (at that time known as Wankie National Park), and two days later released in McIlwaine. Observers recorded that Burchell's zebras stampeded on the approach of the oxpeckers, and blue wildebeest also refused to allow the birds to settle on them; an eland cow even rolled in attempting to dislodge the oxpeckers. In contrast, a giraffe immediately accepted the birds. Nonetheless, the buphagids failed to establish themselves in this park. Then, in 1975, totals of 47 Yellow-billed and twelve Red-billed Oxpeckers, again having been captured in Hwange, were released in the Matobo National Park (then known as the Rhodes Matopos National Park). This exercise was successful in the case of the Yellow-billed Oxpeckers, but the number of Red-billed Oxpeckers was presumably too small to facilitate the establishing of a viable population. Subsequently, however, Red-billed Oxpeckers were reintroduced successfully at other Zimbabwe localities.

Both species of oxpecker have now been reintroduced successfully in South Africa. In 1986, 43 Yellow-billed Oxpeckers from Namibia were transported to the Umfolozi Game Reserve, in KwaZulu-Natal, where breeding in the wild was reported within two years. Red-billed Oxpeckers returned to the Eastern Cape in 1990, with releases made in the Addo National Park, in the Great Fish Reserve, and on a private game farm. Sightings of dark-billed juveniles confirmed that the oxpeckers were breeding successfully, and individuals of both species were also breeding in captivity in holding aviaries. Subsequently, more oxpeckers have been released at these locations, at other protected areas and on farms in this province, and on cattle ranches and reserves elsewhere in the country. Farmers have been encouraged to view oxpeckers as allies in the struggle to control tick burdens on cattle, in conjunction with new chemical agents which are "bird-friendly" and can be used with reduced frequency once the oxpeckers are well established. If this programme is a success, it will offer a much wider distributional range to oxpeckers than merely large game reserves with adequate populations of wild ungulates. Nevertheless, it is clear that the contribution of oxpeckers should not be overemphasized, and they are best seen as one element of an integrated pest-management programme for tick populations.

*The nestlings of **Red-billed Oxpecker** are fed by both parents, and also by helpers, which are usually older siblings, though unrelated adults assisted in one captive group. Up to seven birds have been recorded feeding a brood. Following incubation, lasting about 13 days, the nestling period is up to 30 days for Red-billed Oxpecker. Fledglings feed themselves by 21 days, and after 40 days, begging is aggressively rejected by the adults, although the young may be fed by helpers in the months following fledging. Predation is suspected to be the main source of nestling mortality in the Red-billed Oxpecker. In one study, 72 eggs produced 29 flying young.*

[*Buphagus erythrorhynchus*, Nylsvlei Nature Reserve, South Africa. Photo: Hugh Chittenden]



Since oxpeckers are dependent on hollow trees for nesting, but cannot make their own nest-holes, both veld fires and firewood-collecting reduce their nesting opportunities. This may force them to use less suitable sites, those more accessible to predators, and this often results in lower breeding success. Both drought and fire also have a clear impact on tick populations, and these factors were considered responsible for a decline in the population of Yellow-billed Oxpeckers in the Caprivi region of Namibia. Fire is commonly employed as a management tool in protected areas, and it is increasingly being recognized that the timing and consequent intensity of fires are important in determining the maintenance of dead trees, which provide a habitat for many birds, mammals and other organisms.

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PLATE 39

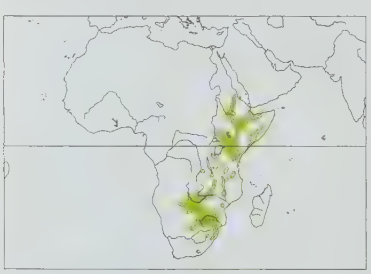
Genus *BUPHAGUS* Brisson, 1760

1. Red-billed Oxpecker

Buphagus erythrorhynchus

French: Piqueboeuf à bec rouge **Spanish**: Picabueyes Piquirrojo
German: Rotschnabel-Madenhacker

Taxonomy. *Tanagra erythrorhyncha* Stanley, 1814, Ethiopia.
Hybrids with *B. africanus* recorded in Zimbabwe. Birds from R Palala, in N South Africa (E Limpopo Province), described as race *caffer*, and birds from Panda, in S Mozambique (Inhambane District), as race *scotinus*, but both considered inseparable from birds in rest of species' range; other proposed races include *invictus* (Somalia, NE Kenya), *angolensis* (SE Angola) and *bestiarum* (S Zimbabwe). Monotypic.
Distribution. Eritrea, Ethiopia, Djibouti, extreme SE Sudan and N, W & S Somalia S, patchily, to SE DRCongo, Zambia, Malawi, extreme SE Angola, NE Namibia (Caprivi region), N & E Botswana, Zimbabwe, N & E South Africa, Swaziland and S Mozambique.



Descriptive notes. 20 cm; 42–59 g. Somewhat variable, with dark olive-brown head to throat and tail, mantle often comparatively paler, most of upperwing darker and more olive-grey; chest to undertail-coverts lighter brown, thighs dark brown; iris yellow to red, bare skin around eye yellow; bill laterally flattened, slightly bulbous towards centre, bright red; legs grey-brown to black. Sexes alike. Juvenile is like adult in plumage; bill initially yellow (at fledging) but changing to dark brown within 2 months, then to red at c. 7 months, eyes dark brown, becoming partly yellow at 4 months and as adult by 6–7 months. Voice. Male song of soft calls interspersed with trills and whistles; in courtship, drawn-out whistling notes. Female has soft song like that of male, may be used for maintaining vocal contact. Sharp hissing "ksss" in alarm; flight call "tsik tsik". Nestlings hiss in alarm; begging call of young "tji tji". Wild ungulates such as rhinoceroses (*Ceratotherium*, *Diceros*) respond to alarm calls of adults.
Habitat. Savanna woodland and farmland, up to 3000 m; absent from forested regions and from arid, treeless areas. Trees required for roosting and breeding. Occurrence dependent on presence of wild ungulates or domestic stock, on which the birds spend almost all of their time.
Food and Feeding. Diet primarily ectoparasites of large mammals, mainly ticks (Ixodoidea), also mites (Mesostigmata), lice (Anoplura), leeches (Hirudinea) and biting flies (Diptera); termite alates (Isoptera) also taken; in addition, feeds to varying extent on blood and mucus from host animal. Ticks mostly of genera *Amblyomma*, *Boophilus*, *Hyalomma*, *Ixodes* and *Rhipicephalus*; flies include particularly those of family Tabanidae, also some of Muscidae. One individual had 1665 ticks in stomach; in captivity ate up to 12,000 tick larvae or 100 adult ticks per day. Cattle are primary hosts in settled areas, where utilizes also donkeys, mules, camels, pigs, even sheep and goats. In game reserves and natural habitats found chiefly on giraffe (*Giraffa camelopardalis*), African buffalo (*Syncerus caffer*), black rhinoceros (*Diceros bicornis*), white rhinoceros (*Ceratotherium simum*), eland (*Taurotragus oryx*), greater kudu (*Tragelaphus strepsiceros*), sable antelope (*Hippotragus niger*), Burchell's zebra (*Equus burchellii*), and impala (*Aepyceros melampus*); also on roan antelope (*Hippotragus equinus*), hippopotamus (*Hippopotamus amphibius*), warthog (*Phacochoerus aethiopicus*), blue wildebeest (*Connochaetes taurinus*), nyala (*Tragelaphus angasi*), lesser kudu (*Tragelaphus imberbis*), oryx (*Oryx gazella*), and large gazelles such as Sömmering's gazelle (*Gazella soemmeringii*). Some mammals, e.g. African elephants (*Loxodonta africana*), common waterbuck (*Kobus ellipsyprimnus*) and bushbuck (*Tragelaphus scriptus*), and even some individuals of regular host species, may reject attentions of oxpeckers by dislodging them, using tail, trunk and horns, and on occasion resorting to rolling. Stalks insects landing on host; also hawks flying insects. Attached parasites are grabbed in bill tip and plucked off skin if visible; ticks hidden in fur are collected by scissoring, in which bill is laid against surface and opened and closed rapidly while being pushed through hair. Pecking, in woodpecker (Picidae) style, with bill closed or slightly open, used both to remove parasites and to open wounds on host. Scissoring employed also to collect fluid at mouth or nasal openings of host, or blood from wounds. Removes scabs and keeps injuries open in order to feed on blood, although areas kept free of maggots and infected tissue; will also create wounds, particularly on domestic animals in poor condition. Diet and feeding methods essentially similar to those of *B. africanus*. Compared with latter, perhaps take smaller ticks, and may spend less time in feeding at wounds. Forages in

small groups, and up to 15–20 individuals seen on a single giraffe. Sometimes found alongside its congener on same host mammal.

Breeding. Breeds following rainfall, Jan–Mar in Eritrea, Ethiopia and Somalia (recorded also Apr, Jul and Aug in Ethiopia); recorded in all months in Kenya and Tanzania, Dec–Feb in Zambia, Oct in Malawi, Oct–Dec in Botswana, Nov–Dec in Zimbabwe, and Oct–Mar in South Africa; up to three broods per season in Kruger National Park, in South Africa. Mating system monogamous; co-operative breeder, pair assisted by group of helpers (adults and subadults), which feed nestlings and fledglings. Courtship, involving wing displays and courtship feeding, and copulation take place on mammal host. Nest composed of hair plucked from host mammals, dried dung, grass and rootlets, placed in natural tree hole 1–15 m above ground, sometimes in cleft in stone or gap in stone wall, site may be used in successive years; only nest-site defended, and no extended territory. Clutch 2–5 eggs, mean 3 (Kruger National Park); eggs white to creamy, less often pale blue or pale pink, usually heavily speckled with reddish-brown and lilac-grey, but sometimes pink and maroon speckles on grey and lavender blotches; incubation by both sexes, period 12–13 days; nestlings fed by both parents and by helpers, up to seven birds feeding brood at one nest, nestling period 27–30 days; fledglings feed themselves by 21 days, and by 40 days begging approach usually aggressively rejected by adults, but young occasionally fed by helpers for up to 90 days after fledging. Few data on breeding success: 49% of eggs laid hatched, and 72 eggs produced total of 29 flying young; predation suspected as main cause of nestling mortality.

Movements. Resident, with only local movements of up to 50 km recorded. Daily flights from roost-sites to relocate host mammals, and homing ability over more than 100 km demonstrated by a translocated bird. Dispersal from natal group likely to be female-biased, and dispersing individuals or vagrants may occasionally move up to 1000 km.

Status and Conservation. Not globally threatened. Widespread in E & SE Africa, and common in game reserves; in 2000, estimates of more than 32,000 individuals in Kruger National Park (South Africa) and more than 3000 in adjacent Mozambique. Current distribution patchy compared with historical records. Successfully reintroduced in parts of former range, and in some regions encouraged in ranching areas as a biological control agent for ticks on domestic stock, in conjunction with chemical control which is not toxic to the birds. Previously, numbers and range greatly reduced as a result of destruction of wild game, and use of toxic chemicals for dipping domestic stock. Beneficial in removing ectoparasites from large mammals, but this must be balanced against direct harm caused by feeding on blood of domestic livestock. Occurs in numerous protected areas, e.g. Tarangire National Park and Mikumi National Park, in Tanzania, Liwonde National Park, in Malawi, and Mahango Game Reserve, in Namibia.

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2. Yellow-billed Oxpecker

Buphagus africanus

French: Piqueboeuf à bec jaune **Spanish**: Picabueyes Piquigualdo
German: Gelbschnabel-Madenhacker
Other common names: Tickbird

Taxonomy. *Buphaga africana* Linnaeus, 1766, Senegal.

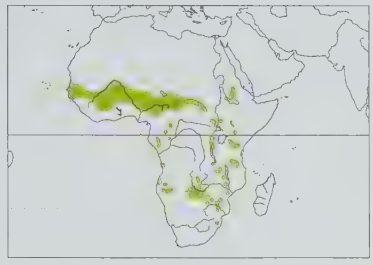
Hybrids with *B. erythrorhynchus* recorded in Zimbabwe. Proposed races *megarhynchus* (described from L Kivu, in E DRCongo) and somewhat larger *haematophagus* (from Andara, on R Okavango, in NE Namibia) synonymized with nominate. Two subspecies recognized.

Subspecies and Distribution.

B. a. africanus Linnaeus, 1766 – SW Mauritania and Senegal E to W, S & E Sudan, NW Ethiopia and W Eritrea, also locally SW Angola (S from Huíla) and N & NE Namibia and, in E, very locally from Uganda and Kenya S to Zambia, Malawi, N Botswana, Zimbabwe, C Mozambique and NE South Africa.

B. a. langi Chapin, 1921 – Congo Basin in Gabon, PRCongo, W DRCongo, and W Angola (S to Benguela).

Descriptive notes. 20 cm; 57–71 g. Somewhat variable. Nominate race has dark brown to olive-grey head to throat, mantle, back, upperwing and tail, contrasting light fawn rump and uppertail-coverts, sometimes with greyish wash; chest to undertail-coverts light brown; iris red,bounded by narrow yellow inner and outer rings; bill laterally flattened, with broad base of lower mandible and bulbous near tip, yellow, distal portion red; legs dark brown to blackish. Sexes alike. Juvenile has plumage like adult, initially has yellow bill and narrow yellow ring around brown eye; within



weeks, both bill and eyering become dark brown, and adult coloration attained within first year. Race *langi* is smaller than nominate, also darker, with greyish rump. Voice. No song described. Buzzing flight call, and high "peep peep" from circling and displaying birds; hissing "kriss kriss" in alarm. In addition to begging calls, young give hollow "chok" calls, and intense snake-like "tchisss" sound in alarm. Wild ungulate hosts, particularly rhinoceroses (*Ceratotherium*, *Diceros*), respond to alarm calls of adult birds.

Habitat. Open savanna, but occurrence dependent on presence of suitable mammalian hosts. Spends virtually all of its time perched on host mammal, and will even sleep there; roosting in trees reported in some areas.

Food and Feeding. Diet primarily ectoparasites of large mammals, and includes ticks (Ixodoidea), lice (Anoplura), fleas (Siphonaptera) and biting flies (Diptera); also blood and other body fluids taken from host. Among recorded food items are ticks of genera *Boophilus* and *Rhipicephalus*, the louse *Damalina bovis*, and the flea *Haematopius suis*. In Senegal, drinks fresh cow's milk from containers when unattended by herdsmen; report from Gambia of nestlings being fed with meat, apparently taken from tethered cattle. Captive individuals ate up to 13,000 tick nymphs or 100 engorged adult ticks per day. Cattle and donkeys now the primary host species in many parts of W Africa, and widely used elsewhere. Of wild ungulates, African buffalo (*Syncerus caffer*) seems to be first choice, with black rhinoceros (*Diceros bicornis*), white rhinoceros (*Ceratotherium simum*), giraffe (*Giraffa camelopardalis*), eland (*Taurotragus oryx*), greater kudu (*Tragelaphus strepsiceros*), zebra (*Equus*), roan antelope (*Hippotragus equinus*), sable antelope (*Hippotragus niger*), hippopotamus (*Hippopotamus amphibius*) and impala (*Aepyceros melampus*) also used regularly; more occasional hosts include warthog (*Phacochoerus aethiopicus*), blue wildebeest (*Connochaetes taurinus*), hartebeest (*Alcelaphus lichtensteinii*) and tsessebe (*Damaliscus lunatus*). Catches flying insects, either on the host or in air; pecks and plucks at wounds and parasites. Collects fluids or ticks concealed in hair of host by using scissoring technique, whereby bill is laid against surface and opened and closed rapidly while being pushed through the mammal's hair. Both food selection and feeding methods essentially similar to those of *B. erythrorhynchus*. Compared with latter, may take larger ticks, particularly engorged females, and spend more time in feeding at wounds. Forages in small groups, and up to 20 individuals seen on a single buffalo. Sometimes found alongside its congener on same host mammal. Several separate groups of oxpeckers may utilize one herd of mammals.

Breeding. Breeds Jun–Sept in Mauritania and Senegal, Apr–Aug in Nigeria, May–Jun in Sudan, mostly Dec–Jun in E Africa, chiefly May–Aug in highland Kenya, Dec in Zambia, and Sept–Mar in Botswana and Zimbabwe. Mating system monogamous; co-operative breeder, pair assisted by 1–6 helpers (extra adults) in raising young. Courtship may involve aerial displays; defends nest cavity against conspecifics and other competitors, e.g. starlings (Sturnidae) and parrots (Psittacidae). Nest in tree hole, either natural cavity or old woodpecker (Picidae) hole, 1·5–15 m above ground (mean 6 m in Kenya), cavity lined with hair plucked from host animals, dry grass, twigs and sometimes feathers; some reports of nesting in buildings. Clutch 2–3 eggs, white to creamy, less often pale blue or pale pink, sometimes plain, or else speckled and blotched with reddish-brown and grey; incubation period 13 days or longer; chicks fed by both parents and by helpers (3–4 adults seen to feed young at two nests), nestling period c. 25 days. No information on breeding success.

Movements. No direct studies; recolonization of Kruger National Park (in South Africa) from Zimbabwe indicates that regular dispersal must occur.

Status and Conservation. Not globally threatened. Locally common, with extensive but fragmented range; categorized as "vulnerable" at S end of range. More localized than *B. erythrorhynchus*, but reasons for this not apparent. In Kruger National Park, in South Africa, population estimated at 500 individuals in 2000; completely absent from the park until 1979, when natural recolonization from Zimbabwe began. Survival of C Mozambique population dependent on protection of game herds. In S Africa, reintroduced successfully both in protected areas and in farmland where chemical control of ticks uses products non-toxic to birds. Species was reduced in range and numbers by past destruction of game and also by introduction of dipping programmes for domestic livestock in which toxic chemicals utilized, but has made significant recovery. Present in many protected areas, including e.g. Waza National Park, in Cameroon, Murchison Falls National Park, in Uganda, Mikumi National Park, in Tanzania, Mahango Reserve, in Namibia, and Kruger National Park, in South Africa.

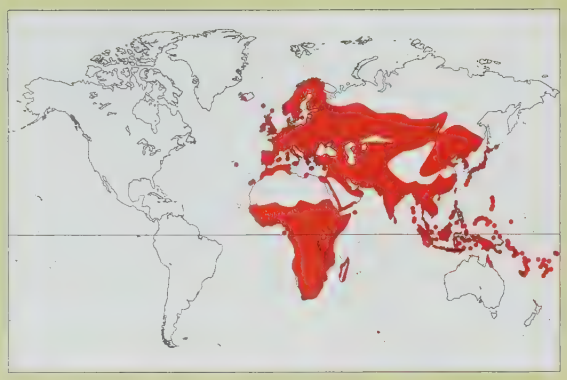
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Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family STURNIDAE (STARLINGS)



- Small to medium-sized passerines with slender to heavy bill; plumage coloration often black, or with brilliant iridescent structural colours.
- 15–45 cm.



- Africa, Eurasia, Pacific islands, and north-east Australia; introduced in many parts of world.
- Forest, grassland, scrubland, orchards, plantations, gardens, villages, urban areas.
- 31 genera, 112 species, 215 taxa.
- 8 species threatened; 5 extinct since 1600.

Systematics

The starlings are an Old World group, with notable radiations in Africa and Asia, including the successful colonization of many Pacific Ocean islands. The family name Sturnidae, proposed in 1815 by C. Rafinesque, is derived from the Linnaean generic name for the Common Starling (*Sturnus vulgaris*) of Europe.

One of the earliest taxonomic overviews was presented by G. R. Gray in his list of the genera of birds. His family Sturnidae was divided into seven subfamilies, three of which comprised New World blackbirds (Icteridae); the other four incorporated genera still widely recognized as starlings, including a separate subfamily for the oxpeckers (*Buphagus*). The brilliant plumage of the African glossy starlings made them a feature of early museum collections, and G. Hartlaub provided early reviews of their taxonomy, while also recording the available biological information. In the first version of *A Catalogue of the Birds in the British Museum*, published in 1877, R. B. Sharpe proposed that the starlings be divided into two families, the Sturnidae, including such genera as *Sturnus*, and the Eulabetidae, which incorporated the glossy starlings from both Africa (*Lamprotornis*) and Asia (*Aplonis*). In 1890, however, Sharpe placed the starlings in a single family, Sturnidae, with the two subfamilies Sturninae and Buphaginae, the latter for the two oxpecker species, alongside the woodswallows (Artamidae), the weavers (Ploceidae), incorporating the waxbills (Estrildidae) and indigobirds (Viduidae), and the larks (Alaudidae). Thus, from an early stage, the oxpeckers were viewed as aberrant starlings.

A. Reichenow associated the starlings with the crows (Corvidae), the drongos (Dicruridae), the orioles (Oriolidae) and the birds-of-paradise (Paradisaeidae), noting only that the tenth, outermost primary (in his numbering the first primary) was much shorter than in members of these groups; he divided the starling species into 37 genera, which included the oxpeckers. H. von Boetticher, like Sharpe, proposed a link with the weaver family, but his comparison of bill structure, vocalizations and nesting behaviour relied on shared characters which were primitive, rather than derived. P. R. Lowe examined skull structure and head musculature, and concluded that Sharpe's proposed division of the starlings into two families, Sturnidae and Eulabetidae, was essentially a functional division into arboreal frugivorous species and ground-feeding, mainly insectivorous starlings. Lowe was also interested in the taxonomic position of the picathartes (*Picathartes*) of the western Afrotropics, and on the basis of their cranial anatomy, in particular the distribution and coloration of the bare areas of skin, he suggested that the two picathartes species might form a subfamily (Picathartinae) of the Sturnidae, along with the Sturninae, Eulabetinae and Buphaginae. Today, the picathartes, known also as rockfowl, are considered to represent an ancient family (Picathartidae) of African origin, with no close links to either the crows or the starlings, the groups with which they were "traditionally" associated; they are believed to be, instead, most closely related to the rockjumpers (*Chaetops*), which are confined to South Africa and Lesotho.

The first authoritative classification of the starling family was set out by D. Amadon, and the 27 genera which he had defined for J. L. Peters's *Check-list of Birds of the World*, published in 1962, were used by most subsequent authors, although Amadon did not cite two publications in German, by von Boetticher, which proposed a number of larger genera with a series of subgenera. B. P. Hall and R. E. Moreau, in their 1970 *An Atlas of Speciation in African Passerine Birds*, followed Amadon's arrangement of the African starlings. Hall and Moreau based their species groupings on the visible characters of museum study skins, together with distributional records, relying heavily on the material available in the collections of what was then the British Museum (Natural History), now known as the Natural History Museum. A departure from this "traditional arrangement" was the checklist produced by H. E. Wolters, who recognized a total of 41 starling genera, and retained the oxpeckers within the family, rather than placing them, as Amadon had done, in a separate subfamily. All of these arrangements were founded on earlier anatomical studies of the skeleton and musculature, along with similarities in plumage characters. Study-skin collections in the larger museums could incorporate all living species in the starling family, yet the anatomical descriptions were always based on a much smaller subset of the taxa. Wolters stated that his checklist was based on cladistic principles, using shared derived characters (synapomorphies) as the key features and not relying on mere overall similarity as a guide, but he provided no explicit data on the characters which he had used and how they had been scored.

From a survey of egg-white proteins of passerines, C. G. Sibley noted some differences among the starling genera, and tentatively suggested possible relationships with the bulbuls (Pycnonotidae), the drongos or the woodswallows. On the basis of similarities in the egg-white proteins and of some features of nesting biology, Sibley and J. E. Ahlquist later proposed that the southern African sugarbirds (*Promerops*) might be derived from starlings. This specu-

lation was not, however, supported by subsequent studies of sugarbirds. Within the African starlings, A. J. F. K. Craig and A. Hartley proposed the arrangement of melanin granules within the feathers, the basis of the structural colours, as an additional character by which to define the genera, and this indicated that several of the accepted starling genera, as defined by visible plumage characteristics, were not monophyletic. A preliminary cladistic phylogeny for the African genera based on morphological and biological characters recognized *Creatophora* as being closest to the Asian *Acridotheres* and *Sturnus*, and suggested some reassignments for the species of glossy starling. There was little anatomical support for a link to the crow family: the corvid humerus has a large single fossa, whereas all starlings examined have a double fossa, which does, however, characterize many other passerine families.

Following their studies in which they employed the method of DNA–DNA hybridization, Sibley and Ahlquist concluded that the starlings were the closest relatives of the New World mockingbirds (Mimidae), and they erected a new superfamily, Muscicapoidea, which included the Sturnidae and the Mimidae together with the thrushes (Turdidae) and the Old World flycatchers (Muscicapidae). This novel suggestion was soon tested by other studies using DNA–DNA hybridization, and then by molecular phylogenies in which both mitochondrial DNA and nuclear DNA were analysed. It is now regarded as well supported by all the available data. While relationships at the family level seemed to be resolved, too few species had been sampled to define the genera of starlings, and C. J. Feare and Craig, in their 1998 monograph on the Sturnidae, used only morphological and biological characters to suggest generic assignments.

The most recent molecular studies have further refined the relationships within the family, and provided tentative dates for the separation of the major lineages. D. Zuccon and his co-workers examined DNA from 29 starling species, together with the two Philippine endemics in the genus *Rhabdornis*. Their results placed the oxpeckers, for long treated as aberrant starlings, as basal to the starlings and the mockingbirds, and they suggested that this lineage had diverged from the ancestral sturnoid group more than 22 million years ago, the split between Sturnidae and Mimidae occurring shortly after that. On their tree, three major starling lineages were identified. One of these was an Asian group including the genera *Aplonis*, *Ampeliceps*, *Gracula*, *Mino*, *Sarcops* and *Scissirostrum* with *Rhabdornis* as an early offshoot, which separated more than 17 million years ago, with *Aplonis* as the youngest branch, having separated about 5 million years ago. The second was an African group, separated 13–17 million years ago, which included Sharpe's Starling (*Pholia sharpii*), placed in the genus *Cinnyricinclus* by Zuccon and colleagues, *Poeoptera*, and some *Lamprotornis* and *Spreo* species. The third lineage identified was a Eurasian–African group made up of *Acridotheres*, *Sturnus* and *Creatophora*, which diverged less than 7 million years ago, the Black-bellied Glossy Starling (*Notopholia corrusca*), then placed in *Lamprotornis*, separated about 13 million years ago, *Onychognathus*, the Madagascan Starling (*Hartlaubius auratus*), which was placed in *Saroglossa*, and the Amethyst Starling (*Cinnyricinclus leucogaster*).

I. Lovette and D. Rubenstein sampled the family much more thoroughly, including 91 starling species in their study, which used both mitochondrial and nuclear genes. They retrieved the same broad pattern, with the oxpecker genus, *Buphagus*, basal to the starlings and the mockingbirds; and then, within the starlings, an initial separation of a tropical Asian clade made up of *Aplonis*, *Ampeliceps*, *Enodes*, *Basilornis*, *Gracula*, *Mino*, *Sarcops*, *Scissirostrum* and *Streptocitta*, with *Rhabdornis* as a distant member, and a second group of mainly Palearctic and Afrotropical starlings but with a few species with ranges extending into tropical Asia. Within this second branch, six clades can be recognized: (1) the Afrotropical Amethyst Starling and the Madagascan Starling; (2) all species formerly in the African genus *Spreo* and most members of the African genus *Lamprotornis*; (3) the Copper-tailed Glossy Starling (*Hylopsar cupreocauda*) and Purple-headed Glossy Starling (*Hylopsar purpureiceps*) of West Africa together with the Black-bellied Glossy Starling of eastern African, all three of which were at the time included in *Lamprotornis*; (4) the African forest-dwelling genera *Poeoptera* and *Pholia* along with the monotypic African genera *Grafisia*, *Neocichla* and *Speculipastor*, as well as the Spot-winged Starling (*Saroglossa spiloptera*) of Asia; (5) the genus *Onychognathus*, which ranges from Africa into the Arabian Peninsula; and (6) the Eurasian genera *Acridotheres*, *Leucopsar* and a broadly defined genus *Sturnus*, together with the Afrotropical species the Wattled Starling



*In the **Sulawesi Crested Myna**, as in other members of the Asian genus* Basilornis*, the feathers of forehead, crown and nape form a rigid crest. Only a few sturnids show such prominent crests, and all are Asian. As well as having distinct morphological traits, starlings of the Asian lineage differ behaviourally from their African counterparts. Recent DNA studies indicate that the starlings are the closest relatives of the New World mockingbirds (Mimidae). The oxpeckers (Buphagidae), long treated as aberrant starlings, probably diverged from the ancestral sturnoid group more than 22 million years ago, with Sturnidae and Mimidae splitting shortly afterwards.*

[*Basilornis celebensis*, Tangkoko-Dua Saudara Nature Reserve, N Sulawesi. Photo: Mark Jones/Roving Tortoise Photos]



*The **Golden Myna** of New Guinea is a medium-sized, distinctively patterned sturnid, with a patch of bare dark blue skin around the eye, extending to a point towards the rear. A white patch on the primaries forms a conspicuous wingbar in flight. Pale patches on the wing are found in all three* Mino *species and in a number of other sturnid genera. A pale rump patch, contrasting with the back plumage, is relatively uncommon in this family, being found in the* Mino *species and in eight other sturnids. The significance of such "flash coloration" is uncertain, as many highly social starlings which flock regularly lack any of these signal features.*

[*Mino anais orientalis*, New Guinea. Photo: Tom and Pam Gardner/FLPA]

(*Creatophora cinerea*). The separation of the two species formerly placed together in *Saroglossa* and their association with very different African taxa is a surprise, as are the separation of the Black-bellied Glossy Starling from other members of the genus *Lamprotornis*, and the close link implied between *Poeoptera* and *Pholia*. The Copper-tailed Glossy Starling and Purple-headed Glossy Starling, on the other hand, had already been placed in a separate genus, *Hylopsar*, by Feare and Craig in their 1998 monograph, while *Creatophora* has for a long time been linked with the *Acridotheres* and *Sturnus* group on the basis of its morphology and behaviour. Rubenstein and Lovette later repeated their analysis for the African starlings, including the only missing taxon, Neumann's Starling (*Onychognathus neumanni*). This corroborated the monophyly of the genus *Onychognathus*, but did not modify any of the other relationships suggested above.

The results of these two molecular studies are in broad agreement, although taxon-sampling was still incomplete for the Asian species. Consequently, no new taxonomic arrangement can be recommended for *Basilornis* at this stage, although this genus may not be monophyletic. The Madagascan Starling, formerly thought to be linked to the Asian *Saroglossa spiloptera* on the grounds of morphological similarity, seems to have been separate from the Amethyst Starling for a long time, and it is considered best, therefore, to use the monotypic genus *Hartlaubius* for the Madagascan taxon. The Philippine species in *Rhabdornis* are now treated as a separate family, Rhabdornithidae, and the oxpeckers likewise form the discrete family Buphagidae, immediately preceding the Sturnidae. For the Afrotropical starlings, the present treatment follows that of Lovette and Rubenstein in using the genus *Hylopsar* for the Copper-tailed Glossy and Purple-headed Glossy Starlings, and the genus *Notopholia* for the Black-bellied Glossy Starling, while expanding the genus *Lamprotornis* to include all the species previously placed in *Spreo* (or in *Cosmopsarus*), but provisionally retaining the genus *Pholia*, rather than including its two species in *Poeoptera*. Although all the species in *Pholia* and *Poeoptera* are forest frugivores from the same region of Africa, the differences in sexual dimorphism and juvenile plumages suggest that, while they may be members of the same clade, they should not be treated as congeneric.

It was readily apparent that Amadon's genus *Sturnus* contained species of differing structure, morphology and behaviour, and Feare and Craig, in their earlier handbook on the Sturnidae, proposed the division of the genus into several genera. In particular, they separated what they regarded as "true" *Sturnus*, defined as highly gregarious and largely terrestrial foragers that have a well-developed "open-bill probing" technique for extracting subsurface invertebrates from grassland (see Food and Feeding), from the generally smaller and more arboreal species with a diet including large quantities of nectar, placing the latter in a resurrected genus *Sturnia*. In addition, they moved two species, the Black-winged Myna (*Acridotheres melanopterus*) and the Vinous-breasted Myna (*Acridotheres burmannicus*), from *Sturnus* to *Acridotheres* on the basis of their close behavioural and vocal resemblances to the latter myna genus, and they retained *Leucopsar* and *Gracupica* as separate genera, this interpretation again based largely on the species' behaviour and vocalizations.

Lovette and his team have now produced a molecular phylogeny for this Eurasian radiation, Zuccon's group of workers following closely, and the present classification represents a modification made in the light of their major conclusions. They agree with Feare and Craig's earlier arrangement in placing ten species, including the Black-winged and Vinous-breasted Mynas, in *Acridotheres* and in retaining the monotypic genera *Creatophora*, *Leucopsar* and *Pastor*. The genus *Sturnus*, however, is now restricted to two species, the Common and Spotless Starlings (*Sturnus unicolor*), which emerge as basal to this radiation and which, furthermore, differ very little from each other in genetic terms. This is in agreement with earlier allozyme comparisons of Common and Spotless Starlings, which implied a very low level of genetic differentiation. Following the current expansion of their ranges and local sympatry in the Iberian Peninsula, hybrids between the two species are reported quite regularly in the field. If introgression continues, it is possible that, at some future stage, the Spotless Starling may revert to its original taxonomic status as a subspecies of the Common Starling.

The molecular data support the inclusion of the Asian Pied Starling (*Gracupica contra*) and the Black-collared Starling (*Gracupica nigricollis*) in the genus *Gracupica*, but there is no support for a broad genus *Sturnia*. The White-faced Starling (*Sturnornis albofrontatus*), confined to Sri Lanka, appears to be highly distinctive, and is assigned to a monotypic genus. This species was formerly known as *Sturnus senex*, but was renamed



Starlings range in body mass from about 35 g up to at least 290 g. None is truly tiny, nor are any of the family near the upper end of the size range for passerines, although at 32 cm, the ***Nias Hill Myna****, the largest of the sturnids, reaches the size of the smaller crows. It is notable for its heavy and strongly curved bill. The Nias Hill Myna has a large patch of bare, yellow skin below the eye, and a separate patch extending into large wattles on the nape. All* Gracula *mynas have these wattles, but in other species they do not meet on the nape, as they do in the Nias form. This species is confined to a few small islands off north-western Sumatra.*

[*Gracula robusta*, Nias I, off NW Sumatra. Photo: Roland Seitre]

following the discovery that the type specimen had been misidentified. The White-faced Starling, together with the Bali Myna (*Leucopsar rothschildi*), is part of a clade which includes, in addition, four species which form a monophyletic group and now occupy a narrower genus *Sturnia*; these four are the Chestnut-tailed Starling (*Sturnia malabarica*), the White-headed Starling (*Sturnia erythropygia*), the Brahminy Starling (*Sturnia pagodarum*) and the White-shouldered Starling (*Sturnia sinensis*). An alternative arrangement would be to place all six species in *Sturnia*; but there is no strong indication that this is the best taxonomic solution, and it is considered better to retain the two monotypic genera. In an earlier discussion of speciation in Indian birds, S. D. Ripley and B. M. Beehler suggested as species pairs the Chestnut-tailed and White-headed Starlings, but also the Chestnut-tailed and White-faced Starlings; while the molecular data do, indeed, show the first two of these as sister-taxa within the same genus, it is not clear which species is the closest relative of the White-faced Starling.

A further two species previously placed in *Sturnus* appear in a clade together with the *Acridotheres* mynas, and are now, on the basis of the molecular data, assigned to the genus *Poliopsar*. These are the Red-billed Starling (*Poliopsar sericeus*) and the



The Asian-Australasian glossy starlings Aplonis *form the youngest branch of the tropical Asian clade, having separated about five million years ago. In the* ***Shining Starling****, the colour of the gloss varies between the races. In the nominate, the crown is glossed purple, and the throat and the long lanceolate feathers on the nape satin-green. These are structural colours, not produced by pigments. The colours, seen only from certain angles, are produced by the reflection and refraction of light passing through the outer keratin layer of the barbules, and striking melanin granules. The granules are arranged in patterns which seem to characterize different genera of starlings.*

[*Aplonis metallica metallica*, Australia. Photo: Roland Seitre]



Many passerines have a head pattern which includes a stripe through, above or below the eye. Starlings generally lack such features, with the striking exception of the ***Flame-browed Starling*** *of Sulawesi, which has a vivid reddish-orange band of feathers reaching from the nares over and behind the eye. In the race* centralis, *the superciliary stripe is yellow. The signal function of such plumage features has not been adequately studied, and descriptions of courtship and other social behaviour are still lacking for many species. The Flame-browed Starling's tail is strongly graduated, which may be an adaptation to reduce the negative impact of a long tail on flight efficiency.*

[*Enodes erythrophris leptorhynchus*, Lore Lindu National Park, Sulawesi. Photo: Pete Morris]

White-cheeked Starling (*Poliopsar cineraceus*). An alternative would be to include them in *Acridotheres*, but they appear somewhat different from the latter. Finally, two species which Feare and Craig had grouped in their genus *Sturnia* emerge as sister-taxa in the molecular phylogeny, with their closest relatives apparently the genus *Gracupica*; consequently, the Purple-backed Starling (*Agropsar sturninus*) and the Red-cheeked Starling (*Agropsar philippensis*) are now placed in the genus *Agropsar*, which was previously used by Wolters for these two species. If the assumptions of a molecular clock can be applied to these data, it would seem that the radiation within some genera, notably *Acridotheres*, is very recent. The extinct Reunion Starling (*Fregilupus varius*), confined to the island of that name, is evidently also derived from this Asian stock.

These new molecular studies provide valuable insights into the phylogeny of the starlings, and highlight the fact that the "traditional" classifications of the group, based on a limited set of morphological traits, probably used characteristics which have undergone independent adaptation in different lineages. Nevertheless, with only one specimen per taxon sampled in many cases, and with data which combine detailed genetic sequences from fresh material with partial sequences from museum specimens of varying age, it can be expected that there will be significant revisions of starling taxonomy in the future. A particularly interesting problem will be that of determining the origins of island endemics, and the sequence of colonization of islands in the Pacific region.

A degree of controversy has arisen in recent years regarding the genus name of the Australasian glossy starlings (*Aplonis*). The original name was first introduced by J. Gould at a meeting of the Zoological Society of London in July 1836. In early October of the same year, Gould's name was reported in print as "*Aplornis*" but a fortnight or so later it appeared as "*Aplonis*". The latter name was used almost universally until this problem in priority was pointed out in 1990. Currently, one school of thought considers *Aplonis* to be a junior synonym of *Aplornis*, which would thus have priority. The other main reading of this case is that *Aplonis* should be considered an incorrect subsequent spelling of *Aplornis*; as such, under the present Code, the overwhelming Prevailing Usage in favour of *Aplonis* would mean that this version should stand, but only if it can be attributed to the "publication of the original spelling". The debate rages on, and an application has been submitted to the International Commission on Zoological Nomenclature to conserve *Aplonis*. In these circumstances, the ICZN Code requires that the established name *Aplonis* continue to be used provisionally until such time as the Commission has taken its decision.

Morphological Aspects

Starlings range in body mass from about 35 g up to at least 290 g. None is truly tiny, nor are any of the family near the upper end of



Instead of eyestripes, some members of the genera Acridotheres *and* Sturnus *have bare skin behind and, often, in front of the eye. More extensive unfeathered areas on the head are found in representatives of the genera* Mino, Basilornis, Sarcops, Streptocitta, Gracula, Acridotheres, Leucopsar, Creatophora *and* Gracupica. *The bare yellow skin around the eye of the south-east Asian* ***Black-collared Starling*** *extends in a triangle behind the eye. The yellow coloration is probably caused by carotenoid pigments, which cannot be synthesized by birds, and must be acquired in the diet. The intensity of pigmentation may be a signal of the physiological and, perhaps, genetic "fitness" of the individual.*

[*Gracupica nigricollis*, Tsim bei Tsui, Hong Kong. Photo: John & Jemi Holmes]

the size range for passerines, although the Nias Hill Myna (*Gracula robusta*) and the Yellow-faced Myna (*Mino dumontii*) attain the size of some of the smaller *Corvus* crows. The sexes often differ, sometimes appreciably so, in size, with males larger than the females, but obvious sexual dimorphism in plumage is limited to some 25 species of the family total of 112. Plumage dimorphism occurs in eight members of the genus *Onychognathus*, in all three *Poeoptera* species, in the monotypic genera *Ampeliceps*, *Saroglossa*, *Cinnyricinclus*, *Creatophora*, *Grafisia*, *Notopholia* and *Speculipastor*, in both members of each of the genera *Agropsar* and *Poliopsar*, and in one species each of *Aplonis*, *Sturnia* and *Lamprotornis*. Only a few of the Sturnidae, all Asian, possess a prominent crest, these being the monotypic genus *Ampeliceps*, the four species in *Basilornis*, two species of *Aplonis* and six species of *Acridotheres*, while several other Asian species have long, erectile head feathers. All members of the family have ten primaries, the outermost of which is reduced to 10–40% of the length of the adjacent one, P9; they have six secondaries, three tertials, and twelve rectrices. As with other bird families, the wing shape is related to habitat and flight requirements, with pointed wings typical of fast fliers in open country, and of long-distance migrants, whereas shorter and more rounded wings are characteristic of birds inhabiting forest and dense vegetation.

Several *Lamprotornis* species, notably the Splendid Glossy Starling (*Lamprotornis splendidus*), have indentations or deep notches on the inner margins of the outer three or four primary feathers. This causes the wings to produce a loud swooshing sound in flight, which is often a useful field character for the human observer. Whereas some other bird species, such as the Cape Sugarbird (*Promerops cafer*), have modified primary wing feathers restricted to males, and the sound produced by them forms an element in the courtship display, the wing noise made by these starlings is apparently an involuntary accompaniment to normal flight, and there is no sexual dimorphism in wing structure; in this case, the sounds produced may have a role in flock cohesion. It is, however, puzzling that sympatric species with similarities in ecology may differ in this respect: for example, wing notches are present in the Cape Glossy Starling (*Lamprotornis nitens*) and the Greater Blue-eared Starling (*Lamprotornis chalybaeus*), yet are absent in the Lesser Blue-eared Starling (*Lamprotornis chloropterus*). No Asian starlings have been described as possessing wing notches, although noisy flight is a feature mentioned by field observers for both the Southern Hill Myna (*Gracula indica*) and the Sri Lanka Hill Myna (*Gracula ptilogenys*).

Greatly extended tail feathers, with the tail longer than the wing, are a characteristic of ten African sturnids and nine Asian ones. These include some species which spend much of their time on the ground, such as the Long-tailed Glossy Starling (*Lamprotornis caudatus*) and Meves's Long-tailed Starling (*Lamprotornis mevesii*) of the African savanna woodlands. Aerodynamic theory predicts that a long tail can significantly reduce flight efficiency, but that greatly narrowed rectrices have the least impact, with a graduated tail the next best option. Only the White-eyed Starling (*Aplonis brunneicapillus*), an Asian forest bird and island endemic, has two thin, protruding tail-streamers. All the other long-tailed species have a symmetrically graduated tail, with the central feathers the longest and the outermost feathers the shortest. Sometimes the wing and tail proportions vary regionally, as with the Red-winged Starling (*Onychognathus morio*), Ethiopian populations of which have a longer tail which routinely exceeds the wing in length. There is no obvious ecological explanation for this variation, as four other members of the same genus occur in Ethiopia, of which the White-billed Starling (*Onychognathus albirostris*) is notably short-tailed, whereas the Bristle-crowned Starling (*Onychognathus salvadorii*) and Slender-billed Starling (*Onychognathus tenuirostris*) are very long-tailed, and the Somali Starling (*Onychognathus blythii*) has a long, graduated tail.

Coloured patches in the primary wing feathers are rufous in the case of female *Cinnyricinclus* and *Poeoptera* species and in both sexes of all except one *Onychognathus* species. In the latter instance the single exception is the Pale-winged Starling (*Onychognathus nabouroup*), the wing patch of which appears white in flight, since the inner vanes of the feathers are creamy white and only the narrow outer vane is rufous. The extent of the coloration on the individual feathers varies among different species, so that in some cases the field impression is of a large coloured area with a narrow black border at the feather tips, whereas in others the patch appears more centrally positioned. Pale patches in the wing, visible in flight, are found also in the monotypic genera *Neocichla*, *Hartlaubius*, *Saroglossa*, *Speculipastor* and *Ampeliceps*, in the three *Mino*, the five *Gracula* and all ten *Acridotheres* mynas, in both species of each of the genera *Agropsar* and *Gracupica*, in the Red-billed Starling in the genus

The genus Agropsar *has often in the past been subsumed in* Sturnus. *On the basis of their small size, nectarivorous diet and arboreal habits, the Red-cheeked* (A. philippensis) *and* ***Purple-backed Starlings*** *were recently separated from* Sturnus, *and assigned to the resurrected genus* Sturnia. *But more recently still, molecular studies have found no support for a broad genus* Sturnia. *The Purple-backed and Red-cheeked Starlings emerged as sister-taxa in a molecular phylogeny, and were placed alone in the genus* Agropsar. *They may form a superspecies. Their closest relatives appear to be members of the genus* Gracupica.



[*Agropsar sturninus*, Otindag Sandy Land, Inner Mongolia, China. Photo: Zhao Chao]



A few species of sturnids have been found to have a brush-tipped tongue, a feature typical of nectarivorous birds such as sugarbirds (Promeropidae) and honeyeaters (Meliphagidae). This has been described for the Madagascan Starling (Hartlaubius auratus) *and some Asian species, including the* ***Brahminy Starling****. But the Brahminy Starling also forages on the ground, and shows adaptations for opening the bill forcefully when probing or prying, a style of feeding fully developed in other genera, particularly* Sturnus. *The Brahminy Starling has a long wispy crest formed by elongate and hackled crown feathers. The feathers of the nape and upper breast are also hackled.*

[*Sturnia pagodarum*, Bangalore, Karnataka, India.
Photo: Clement Francis]

Poliopsar, and in the Chestnut-bellied Starling (*Lamprotornis pulcher*). White tips on the outer tail feathers, also conspicuous in flight, are found in nine *Acridotheres* species, two other Asian sturnids, namely the White-shouldered Starling and Asian Pied Starling, and the Madagascan Starling. A pale rump patch, contrasting with the back plumage, is much less common in this family, being found only on the Wattled Starling, the Vinous-breasted and Black-winged Mynas, all three species of *Mino* and both species of *Gracupica*, and the Apo Myna (*Basilornis mirandus*), the White-cheeked Starling and the Purple-backed Starling. The significance of such "flash coloration" is obscure, as many highly social starlings which flock regularly, such as the Common Starling, lack any of these signal features. Human appreciation of the plumage of many starlings, however, probably differs markedly from these birds' own perceptions, since recent studies have revealed that Common Starlings have well-developed detection of light in the ultraviolet range. This ability may be of assistance to the birds when searching for food, especially ripening fruit, but it could also provide cues from the plumage which are of value in social behaviour.

Wing moult follows the descendant pattern typical of most passerine families, the feathers being replaced in sequence from the inner ones outwards. The primary moult of the Wattled Starling is frequently suspended, this apparently in association with the species' nomadic movements (see Movements), and this has been reported also for the Rose-coloured Starling (*Pastor roseus*) and some of the migratory species in Eurasia. The Amethyst Starling exhibits an interesting pattern over its extensive range, where the timing of the moult period appears to be more constant among different populations than the breeding season or seasonal movements. Thus, in different regions, the birds may breed, moult and then migrate, while others breed, migrate and then moult, and yet others moult before migrating to their breeding areas. This colourful species is well represented in many museum collections, and its moult pattern was established by M. Traylor from a careful examination of hundreds of specimens for which accurate date and locality information was available. This is a timely reminder of the valuable biological information which can be gleaned from well-curated museum collections.

For most species, the typical pattern of feather replacement seems to be a complete moult at the end of the breeding season. Nevertheless, for some African starlings such as the Red-winged Starling, which may have several broods in the course of a single season, an overlap between moult and breeding occurs regularly while the later broods are still being fed. Such overlap is associated with a reduction in the number of new wing feathers growing out at the same time, typically with only one actively growing feather in each wing. The timing of moult may also differ between the sexes in such cases, females taking charge of the last brood and deferring their moult, whereas males start the moult and abandon parental care. Among African passerines, this sexual dimorphism in moult appears to be correlated with sexual dimorphism in plumage, and may therefore be less common among the monomorphic starlings. The new generation of fledglings has either a complete or a partial post-juvenile moult, with some apparent taxonomic correlation; many Eurasian starlings have a complete first moult, whereas this moult tends to be partial among African species, with the exception of the Wattled Starling. For a number of the species, however, adequate information on the moult sequence is still lacking.

Our understanding of the hormonal control of moult in passerine birds in general remains surprisingly poor. Experimental manipulation of the photoperiod to mimic seasonal changes in daylength suggested that periodic events in the annual cycle of Common Starlings, such as moult, breeding and migration, were under the control of circannual rhythms, inherited patterns the precise timing of which is set by particular environmental stimuli termed *Zeitgeber*. E. Gwinner and his colleagues even induced several moult cycles within a single year among captive Common Starlings by producing, in the laboratory, an artificially accelerated cycle of the appropriate annual changes in daylength. Experiments with the male hormone testosterone showed that this delayed the onset of moult in male Wattled Starlings and Common Starlings, and could also lead to interruption of the moult. A preliminary conclusion was that, for male birds, moult might be retarded by testosterone and stimulated by thyroxine, produced in the thyroid gland, so that moult would be regulated by a push–pull action of these two hormones, within the limits of a "moulting window", the fixed period in the annual cycle during which moult could occur. In field studies in Kenya, it was found that male Greater Blue-eared Starlings did not moult during the period of peak levels of testosterone and luteinizing hormone,





The Acridotheres *mynas are part of a clade of Eurasian genera that includes a broadly defined* Sturnus *and the Bali Starling* (Leucopsar rothschildi), *together with the Afrotropical Wattled Starling* (Creatophora cinerea). *The* ***White-vented Myna*** *is a typical blackish myna, with a prominent frontal crest and elongated crown feathers. The* ***Vinous-breasted Myna****, on the other hand, is atypically small, with pale plumage, although like other* Acridotheres *mynas its forehead and crown feathers are hackled and elongate. The Vinous-breasted Myna, along with the Black-winged Myna* (A. melanopterus), *is sometimes placed in the genus* Sturnus, *but both appear behaviourally and vocally closer to the mynas. A molecular phylogeny for the Euasian radiation of Sturnidae has reinforced the inclusion of the Vinous-breasted and the Black-winged Myna among the ten* Acridotheres *species. Nine of these have white tips on the outer tail feathers, which are conspicuous in flight. All* Acridotheres *species have pale patches on the wing, which are also visible in flight.*

[Above: *Acridotheres javanicus*, Bangkok, Thailand.

Below: *Acridotheres burmannicus leucocephalus*, Kaeng Krachan National Park, Thailand. Photos: Tom Stephenson]



The plumage of the male ***Somali Starling*** *is mostly uniformly purple-black. The female differs in having the head, throat and breast plain ash-grey. Although male sturnids are sometimes appreciably larger than females, obvious sexual dimorphism in plumage is limited to some 25 species out of the family total of 112.* Onychognathus *starlings range from Africa into the Arabian Peninsula. Nine of the eleven species are sexually dimorphic as adults, the females regularly having a grey head. Juveniles resemble the adult male, and have uniformly dark plumage, the first grey feathers not appearing on the heads of the young females until at least six months after fledging. Among African passerines, species that are sexually dimorphic in plumage may also differ sexually in the timing of the moult, with females taking charge of the last brood and deferring their moult, whereas males start their moult earlier and abandon parental care. Greatly extended tail feathers, with the tail longer than the wing, are a characteristic of ten African and nine Asian sturnids. Sometimes wing and tail proportions vary regionally, as with the Red-winged Starling* (O. morio)*, Ethiopian populations of which have a tail which routinely exceeds the wing in length. There is no obvious ecological explanation for this, since of four other members of this genus that occur in Ethiopia, the Somali Starling, the Bristle-crowned Starling* (O. salvadorii) *and the Slender-billed Starling* (O. tenuirostris) *are all long tailed, whereas the White-billed Starling* (O. albirostris) *is notably short-tailed.*

[*Onychognathus blythii*, Socotra.
Photo: Hanne & Jens Eriksen]

nor did females during the peak levels of luteinizing hormone and 17-β-estradiol. At the same study site, however, there was no detectable cyclic variation in the levels of these hormones in Rüppell's Glossy Starling (*Lamprotornis purpuroptera*), yet moult was well synchronized in the population, despite considerable individual variation in blood hormone levels. More recently, experimental work on the Common Starling has demonstrated that neither changes in photoperiod nor the regression of the gonads, both of which normally occur at the end of the breeding season, were regularly linked to the start of the moult. Nevertheless, the start of the moult always followed a period when the production of the hormone prolactin had reached a peak. In the normal annual cycle, this would coincide with the end of the phase of parental care, when all breeding activity is tailing off. It remains to be seen if these findings are of general application, and not specific to the Common Starling; prolactin levels were not monitored during the earlier investigations.

Many starlings have strikingly iridescent plumage, the African glossy starlings producing stunning combinations of green, blue and purple. It has been known for a long time that these are structural colours, not produced by pigments. In fact, one of the early applications of electron microscopy was to describe the internal structure of iridescent feathers in different bird families, including a selection of starlings. The only pigment present is melanin, concentrated into discrete granules, which may be round or flattened and which, in the case of some African starlings, have internal air spaces. Within the barbules of the feather, these granules are arranged in patterns which seem to characterize different genera of starlings. The colours to be seen from a particular position can be defined in simple physical terms by the reflection and refraction of light passing through the outer keratin layer of the feather barbule, and then striking the melanin granules.

The realization that bird vision extends into the ultraviolet region of the spectrum has led to a reassessment of the plumage patterns of some species from the bird's eye view. For the Common Starling, some experimental work suggests that individual plumage differences visible only in the ultraviolet range may influence mate selection. Future research on the visual signals used by other starling species will now have to look beyond the mere human range of vision.

No starling species exhibit a seasonal alternation of plumage as a result of a moult. Common Starlings in fresh plumage do, however, have pale tips on the feathers, producing a heavily speckled pattern, but, as these pale tips gradually disappear through abrasion, the birds become more uniformly dark in appearance. The freshly moulted feathers of Spotless Starlings, on the other hand, display a dull greyish "bloom", and this also wears away to reveal the spectacular iridescence of the adults' plumage. Juveniles of all starlings are duller than the adults in appearance, generally lacking any iridescence, and are often spotted on the ventral surface. In the genus *Poeoptera*, juveniles resemble the female, and young males therefore initially have a chestnut patch in the primary feathers; at the first complete moult, the male replaces the wing feathers with those typical of the adult male, lacking a coloured patch. Nine of the eleven *Onychognathus* species are sexually dimorphic as adults, the females having a grey head. In this case, however, the juveniles resemble the adult male and have uniformly dark plumage, the first grey feathers on the head of the young females not appearing until at least six months after fledging.

Compared with most other passerine bird families, a high proportion of starlings have a red, yellow or creamy-white iris, and the juveniles of all such species initially have a dark eye. The eye colour of the juveniles usually changes by the end of the first year, although this process may take longer in some species. The pigments or structures responsible for iris coloration have not been investigated in detail; in the African Pied Starling (*Lamprotornis bicolor*), it appears that pteridines are responsible for the white appearance of the adult iris. Since human observers can recognize age categories on the basis of iris coloration, it is likely that the latter plays some role in the social organization of those species having coloured eyes. In addition, changes in pupil size, which can be under voluntary control in birds and not influenced solely by the autonomic nervous system, result in the display of a larger or smaller area of coloured iris, depending on whether the pupil is contracted or dilated, and this may serve as an important close-range signal during interactions between individual birds in a flock. Indeed, some field observations suggest that dominance relationships may be indicated by such subtle signals. For example, during food exchanges, or allofeeding (see



Following molecular studies, some Afrotropical glossy starlings have been reassigned to different genera. The ***Cape Glossy Starling*** *however remains in an expanded* Lamprotornis. *Several* Lamprotornis *species have deep notches on the inner margins of the outer primaries. This causes the wings to produce a loud swooshing sound in flight. There is no sexual dimorphism in wing structure; the wing noise is apparently an involuntary accompaniment to normal flight, and may have a role in flock cohesion. Sympatric species with similarities in ecology may differ in this respect. Wing notches are present in the Cape Glossy Starling and the Greater Blue-eared Starling* (L. chalybaeus), *yet absent in the Lesser Blue-eared Starling* (L. chloropterus).

[*Lamprotornis nitens*, Bube, S Zimbabwe. Photo: Warwick Tarboton]



While some Lamprotornis *species, such as the Cape Glossy Starling* (L. nitens), *have predominantly or entirely glossy plumage, a number of* Lamprotornis *starlings combine glossy, metallic upperparts with brown or chestnut underparts. For example, the crown, chin, throat and upper breast of* ***Shelley's Starling*** *are a glossy dark purple, its upperparts dark glossy blue, its wing bronze-green and its tail glossy blue-green. Its underparts, from the lower breast down, are uniformly dark rufous-brown. Sexes are alike in Shelley's Starling, but in some* Lamprotornis *species the female, though similar, may be duller.*

[*Lamprotornis shelleyi*, Negele, Ethiopia. Photo: Ketil Knudsen]

General Habits), involving African Pied Starlings, the donor bird contracts the pupil and displays a large area of white iris, whereas the individual accepting the food, in a juvenile-like begging posture, dilates its pupil and minimizes the area of coloured iris on display. In the case of the Black-bellied Glossy Starling, changes in eye colour have been observed while the bird is held in the hand: the yellow eye facing the observer is apparently flushed with blood and turns red within a few seconds, while the eye on the opposite side of the head remains unaffected. Male Black-bellied Glossy Starlings, incidentally, appear to retain red eyes during breeding activity under natural conditions. Such spontaneous eye-colour changes have not been observed for any other yellow-eyed glossy starlings when they are handled. This is an area of study in which the filming of the behaviour of captive groups, or of individuals which are habituated to the close approach of the human observer, could be very revealing. The sexes of Common and Spotless Starlings differ in iris colour. Males of these two species have the iris largely brown, whereas the iris of females bears a pale outer ring, this difference providing a useful sex-recognition identifier in population studies.

Starling bills vary from being an elongated probe to being a powerful, hooked structure suggesting predatory habits. In a few



A large starling with predominantly glossy plumage, the ***Long-tailed Glossy Starling*** *has an extremely long, strongly graduated, supple tail. The rectrices are paired in step-like fashion. Although the sexes are similar in plumage, the male is visibly larger than the female. Like Meves's Long-tailed Starling* (Lamprotornis mevesii) *with which it forms a superspecies, the Long-tailed Glossy Starling spends much of its time on the ground. Both species are found in open, park-like savanna woodland; the Long-tailed Glossy Starling may also be found in farmland and well-wooded residential areas. Greatly extended tail feathers are a characteristic of ten African sturnids, and nine Asian ones.*

[*Lamprotornis caudatus*, Western Division, Gambia. Photo: Dick Forsman]



Although it has some bronze sheen on its back and rump, ***Fischer's Starling*** *generally lacks the metallic gloss of most of its congeners. Its crown, nape and upperparts, chin, throat and breast are dull ash-grey, its flight-feathers and tail dull bronzy green, and its belly, flanks, thighs and undertail-coverts white. Fischer's Starling has sometimes been placed in a separate genus,* Cosmopsarus, *along with both the similarly dull, uniformly grey Ashy Starling* (Lamprotornis unicolor), *which has an oily green sheen on the wing and tail feathers, and the highly distinctive, colourful and glossy Golden-breasted Starling* (L. regius), *with which Fischer's Starling sometimes associates.*

[*Lamprotornis fischeri*, Samburu National Park, Kenya. Photo: Dave Richards]

cases, the Bristle-crowned Starling being one example, the feathers at the base of the bill are directed forwards, covering the nostrils, an arrangement typical of many corvids. The bill is always proportionately narrow at the base, unlike the wide, flattened bill of fly-catching passerines. Although the bill of many sturnid species is of a uniformly dark colour throughout life, as typified by, for instance, most red-winged starlings in the genus *Onychognathus*, there are some exceptions, such as the White-billed Starling, and others in which age-related or seasonal changes in bill coloration occur. In the African Pied Starling, for example, the white at the gape and base of the bill which characterizes the nestling is retained for much of the first year, during the juvenile stage. By the second year, both the gape and the base of the lower mandible have turned yellow, and during that year the yellow coloration advances progressively farther along the lower mandible, so that adults and subadults can be distinguished by this feature. The bill of the Common and Spotless Starlings is dark brownish-black in the non-breeding period, but it becomes yellow before and during the breeding season, at which time the adults of the two sexes can be distinguished by the colour of the base of the bill, males having a bluish bill base and females a pinkish one.

Jaw musculature and skull structure are influenced primarily by feeding ecology. In their study of the foraging behaviour of the Sturnidae, M. S. Dubale and G. Patel linked these anatomical details to feeding behaviour for the Common Myna (*Acridotheres tristis*) and the Rose-coloured Starling. Meanwhile, W. J. Beecher, having dissected a number of starling species, found that the generalized arrangement, typical also of many Old World insectivorous families such as the sylviid warblers, has a series of parallel muscles emphasizing adduction rather than protraction. The skull is broad, with lateral extensions, or "wings", on the ectethmoid bone. This condition was found in members of the Afrotropical genera *Cinnyricinclus*, *Grafisia*, *Lamprotornis*, *Onychognathus*, *Poeoptera* and *Speculipastor*, as well as in the Asiatic *Aplonis*, *Basilornis*, *Gracula*, *Mino*, *Sarcops* and *Streptocitta*. In the specialized Grosbeak Starling (*Scissirostrum dubium*) the protractor of the quadrate bone is greatly enlarged, as are its antagonistic muscles attached to the pterygoid and palatine bones. This arrangement resembles that typical of the woodpeckers (Picidae), which evidently provides a muscular shock-absorber, protecting the brain from concussion when the bill is used to strike a hard surface. Other starlings show progressive adaptations for opening the bill forcefully when probing or prying. This involves development of the protractor muscles for elevating the upper mandible, and depressing the lower mandible, and Beecher noted it in two Asian species, the Rose-coloured Starling and Brahminy Starling, and in the Madagascan Starling. Although the muscles of these species are modified, the anterior part of the skull is still broad. He identified another group of starlings in which the protractor muscles are further enlarged, and there is a narrowing of the skull and reduction of the ectethmoid wings; this group included several Eurasian species in the *Acridotheres* and *Sturnus*



Sole species in the genus Grafisia, *the* ***White-collared Starling*** *is sexually dimorphic. The male is uniformly glossy blue-black, except for a white patch on the upper breast, which ends sharply in line with the wing. The female is charcoal-grey without gloss, but with feathers from the crown to rump tipped blue-black, and with dull black wings and tail. Both sexes have a yellow iris. Compared with most other passerine families, a high proportion of starlings have a red, yellow or creamy-white iris, and the juveniles initially have a dark eye. The eye of the juvenile White-collared Starling is dark brown. Juvenile eye colour usually changes by the end of the first year, although this may take longer in some species.*

[*Grafisia torquata*, Ngaoundaba, Cameroon. Photo: Ron Hoff]

clade, as well as their African relative *Creatophora*. The probing style of feeding is most highly developed in three species, the Common Starling, the Spotless Starling and the White-cheeked Starling. In these sturnids, not only are the protractor muscles very strongly developed but, in addition, the skull is greatly narrowed, with the ectethmoid no longer in contact with the jugal bones, and the eye can be moved forwards to peer down along the line of the bill.

A small number of species in the Sturnidae have been found to have a brush-tipped tongue, a feature typical of nectarivorous birds such as the southern African sugarbirds and the mainly Australasian and Oceanian honeyeaters (Meliphagidae). The tongue of the Reunion Starling, sadly now extinct (see Status and Conservation), has a distinctive frayed tip, and a similarly brush-tipped tongue has been described for the extant Madagascan Starling and some Asian species, such as the Brahminy Starling.

The presence or absence of rictal bristles at the base of the bill was formerly cited as a character which separated the starlings into distinct groups. The functional significance of these structures, however, remains unclear. Rictal bristles are especially prominent in some insectivorous birds, such as the nightjars (Caprimulgidae) and the muscicapid flycatchers, but they are conspicuous also in the frugivorous barbets (Capitonidae). Anatomically, they represent feather shafts lacking vanes, typically innervated by tactile sensory neurones. These bristles can in most cases be moved, and at least in the case of the nightjars, and probably also other birds, the best current explanation seems to be that they serve to protect the eyes.

Possession of a prominent crest of feathers is largely restricted to the Asian genera *Basilornis* and *Acridotheres*, but is a feature also of two species of *Aplonis* and the Bristle-crowned Starling of East Africa. Several other species, such as the Bali Myna, the Rose-coloured Starling and the Golden-crested Myna (*Ampeliceps coronatus*), have elongated head feathers which they may erect to form a conspicuous crest during display. Whereas many passerines have a head pattern which includes a stripe through, above or below the eye, such features are generally not present on starlings, although some members of the genera *Acridotheres* and *Sturnus* have bare skin behind and, often, in front of the eye, as does the Wattled Starling. A striking exception is the Flame-browed Starling (*Enodes erythrophris*) of Sulawesi, with its vivid reddish-orange stripe above the eye. The signal function of these plumage features has not been adequately explained, as descriptions of courtship and other social behaviour are still lacking for many of these species.

More extensive bare, unfeathered areas on the head are found in representatives of the genera *Mino*, *Basilornis*, *Sarcops*, *Streptocitta*, *Gracula*, *Acridotheres*, *Leucopsar*, *Gracupica* and *Creatophora*. Colour changes of the bare areas, resembling blushing, may be associated with blood flow in some of these species. In many cases, the yellow coloration of the skin is probably caused by carotenoid pigments, a group of pigments which has been the focus of recent research interest, as they cannot be synthesized by birds but, instead, require the acquisition of pigments or their precursors in the diet. Thus, it is argued that the intensity of carotenoid pigmentation is an accurate signal of the physiological and, perhaps, genetic "fitness" of the individual and could be a factor influencing the female's mate choice. This suggestion awaits experimental testing with regard to starlings. The bluish bare skin around the eyes of the Bali Myna has been confirmed as being an example of structural coloration, whereby arrays of parallel collagen fibres in the dermis of the skin produce the blue coloration by coherent scattering of light; presumably, the same explanation applies in the case of the White-faced Starling, which also has bluish bare skin around the eye. It is now evident that collagen fibres may enhance the coloration produced by carotenoid pigments in other bird species, and this should be examined with regard to other starlings, too. In addition to these permanent features, the facial feathers of Common Starlings often become abraded during the breeding season, producing bare areas around the base of the bill, sometimes extending backwards to as far as the eyes. This may be a result of the frequent open-bill probing involved in procuring food for the young. Exceptionally, Common Mynas lose the feathering from most of the head, so that the individual is totally yellow-headed, but the reason for this is unknown, and it may prove to be a pathological condition.

The starlings with bare facial skin are, with one exception, found in Asia. The single exception is the Wattled Starling, but this species, as noted above (see Systematics), is evidently of Asian origin. It is the only species which exhibits a seasonal change in either the extent or the coloration of the patches. With this species, the bare areas develop on adult males in breeding



The bills of many sturnid species are of a uniformly dark colour throughout life. The bill of the adult ***Magpie Starling*** *is black, whereas that of the juvenile is brown. In other species, age-related or seasonal changes in bill coloration occur. In the African Pied Starling* (Lamprotornis bicolor), *for example, the white at the gape and base of the bill, which characterizes the nestling, is retained for much of the first year. By the second year, both the gape and the base of the lower mandible have turned yellow, and during that year the yellow coloration advances progressively along the lower mandible, so adults and subadults can be distinguished by this feature.*

[*Speculipastor bicolor*, N Kenya.
Photo: Michael Gore]



Sharpe's Starling *is found in montane forests, where it forages mainly in the canopy. Leg proportions of starlings differ according to the species' lifestyle. Tree-dwellers like* Pholia *and* Poeoptera *hop along on their relatively short legs. Those that usually forage on the ground walk or even run, and have longer legs. There are minor differences in leg musculature in different starling species according to the style of locomotion, but these are apparently not informative of taxonomic relationships. Although all the species in* Pholia *and* Poeoptera *are forest frugivores from the same region of Africa, differences such as sexual dimorphism in* Poeoptera *but not* Pholia *suggest that they should not be treated as congeneric.*

[*Pholia sharpii*, Ruhija, Uganda. Photo: Pete Morris]

condition, under the influence of male hormones, notably testosterone. The process has attracted the attention of physiologists, because of the apparent parallels with baldness in human males. There is considerable individual variability in the development of the pendulous wattles. Both sexes retain a small area of naked skin behind the eye at all times, and old female Wattled Starlings sometimes also develop featherless and pigmented areas on the head. Females of all starling species, however, do acquire a typical brood patch, losing much of their ventral feathering to produce an area of highly vascularized skin during the incubation period. This is a very useful feature for confirming the sex and breeding status of a starling in the hand, since extensive and vascularized brood patches have not been found on males of this family, even when the males cover the eggs during their incubation stints. It appears, in fact, that male sturnids do not incubate in the strict sense of the word, but that their sitting on the eggs helps to reduce heat loss during the female's absence.

Leg proportions of starlings differ according to the species' lifestyle, whether it is more arboreal or more terrestrial. Those which usually forage on the ground walk or even run, and have longer legs, whereas tree-dwellers hop, moving their relatively shorter legs simultaneously. The leg musculature is naturally adapted to the style of locomotion, and there are minor differences in the proportions and insertions of particular muscles in different starling species. These are significant from a functional viewpoint, but are apparently not informative of taxonomic relationships.

Habitat

With a natural range extending from the Arctic Circle southwards to beyond the tropics, where some species range above 4000 m in the mountains, starlings are clearly not narrow habitat specialists. Members of the Sturnidae inhabit forest and forest edge, savanna and other grasslands, macchia, semi-arid to desert scrubland, orchards and plantations, and commonly enter gardens in villages, towns and cities. Only the barren sandy wastes of the deserts in north Africa and Asia do they skirt or fly over without stopping off. They must have colonized many of the Pacific Ocean islands where they are now found by making over-water flights, and several regular migratory routes of starlings cross large areas of open sea (see Movements).

Evergreen forest is the principal habitat for starlings in Asia, where 39 species are categorized as forest birds, compared with 24 in open woodland, agricultural and urban areas, and only a few, such as the Rose-coloured Starling, regularly occurring in steppe or treeless grassland regions. For African starlings, on a continent with a long history of arid periods, there are 13 true forest species; the majority of sturnids in this region, 32 species, including the Madagascan Starling, are found in savanna woodland, and only the African Pied Starling and the Wattled Starling are typical of open grassland over a large part of their ranges.

Forest starlings show a clear division into species inhabiting lowland forest and those preferring the high mountain forests, yet it is surprising that there is none in the highland forests of New Guinea. On the Philippine island of Mindanao, the Asian Glossy Starling (*Aplonis panayensis*) and the Coleto (*Sarcops calvus*) occur in the lowlands, with the Apo Myna restricted to forests above 1200 m. Some African members of the family, such as the White-crowned Starling (*Lamprotornis albicapillus*), occur in relatively arid thornveld, and some of the cliff-nesting *Onychognathus* species range into desert areas in Africa and in the Arabian Peninsula.

Many sturnid species have proved well capable of adapting to environments modified by humans. A good example of this can be seen in the heavily populated regions of Asia, where numerous starlings are today closely associated with human activity, and it is difficult to visualize what habitats they may have occupied previously.

General Habits

While some Asian starlings have been sighted only singly or in pairs, it is possible that this, rather than representing a distinctive type of social organization, may relate more to the difficulty of observing birds in the forest canopy, and perhaps the current rarity of the species concerned. Nevertheless, some species, such as



*Changes in the eye colour of the **Black-bellied Glossy Starling** have been observed while the bird is held in the hand. The yellow eye facing the observer is apparently flushed with blood, and turns red within a few seconds, while the eye on the opposite side of the head remains unaffected. Male Black-bellied Glossy Starlings appear to retain red eyes during breeding activity under natural conditions. Such spontaneous eye-colour changes have not been observed for any other yellow-eyed glossy starlings when they are handled. Since human observers can recognize whether a starling is subadult or adult on the basis of iris coloration, it is likely that this plays some role in the social organization of those species with coloured eyes. In addition, changes in pupil size, which can be under voluntary control in birds and not influenced solely by the autonomic nervous system, result in the display of a larger or smaller area of coloured iris, depending on whether the pupil is contracted or dilated. This may serve as an important close-range signal during interactions between individual birds in a flock. Some field observations suggest that dominance relationships may be indicated by such subtle signals. For example, during food exchanges, involving African Pied Starlings* (Lamprotornis bicolor), *the donor bird contracts the pupil and displays a large area of white iris, whereas the individual accepting the food, in a juvenile-like begging posture, dilates its pupil and minimizes the area of coloured iris on display.*

[*Notopholia corrusca corrusca*,
Mkuzi Game Reserve,
KwaZulu-Natal,
South Africa.
Photo: Dick Forsman]



Most members of Sturnidae are sociable, and found in flocks of varying size through much of the year. The ***Golden-breasted Starling*** *often forages in small groups; it also feeds in loose association with Fischer's Starling* (Lamprotornis fischeri). *Flocks may offer their members greater security from predators, reducing the statistical likelihood of an individual becoming a victim, and providing more eyes to look out for threats. Some large sturnid species such as the Common Myna* (Acridotheres tristis) *and the Common Hill Myna* (Gracula religiosa) *are more often found foraging in pairs, and may maintain a rigid pair structure throughout the year. But these species may still join communal roosts, which can contain tens to thousands of individuals.*

[*Lamprotornis regius*, Negele, Ethiopia. Photo: Ketil Knudsen]

the Common Myna and the Common Hill Myna (*Gracula religiosa*), may maintain a fairly rigid pair structure throughout the year. Most members of the Sturnidae, however, associate in flocks of varying size through much of the year, and even when breeding they are often clustered or even densely colonial, with nests less than 2 m apart.

Mixed-species flocks, which can include birds from several different families, occur in foraging associations of both frugivores and insectivores. Such flocks seem to offer their members greater security from predators in that, statistically, an individual's chances of being the victim of a predator are reduced when alternative prey is close at hand, and also because many eyes provide a greater chance that the predator will be spotted before it can launch an attack. Flocking may arise also through "local enhancement", whereby those birds which are already feeding attract additional individuals to what are usually patches of superabundant food. Starlings have not often been recorded as participants in mixed-species flocks of insectivorous birds. In South Africa, the Cape Glossy Starling was an occasional flock-member in both mixed woodland and acacia (*Acacia*) woodland, while the Purple-headed Glossy Starling joined both insectivorous and frugivorous flocks in Gabon. Four sturnids characterized as "gleaners" were noted as members of insectivore flocks in South-east Asian forests; these four were the Asian Glossy Starling, the Golden-crested Myna, the Common Hill Myna and the Purple-backed Starling. Farther east, on San Cristobal, in the Solomon Islands, the Makira Starling (*Aplonis dichroa*) joined flocks in which monarch-flycatchers (Monarchidae) were core members.

In Africa, observations in Gabon of frugivorous birds in fruiting trees, an assemblage which included Purple-headed Glossy and Splendid Glossy Starlings, green pigeons (*Treron*), hornbills (Bucerotidae), turacos (Musophagidae) and bulbuls (Pycnonotidae), indicated that raptors flying over the canopy tried to attack birds in such mixed groups more often than they did individuals in single-species flocks of frugivores, whereas far fewer attacks were made on the flocks of insectivorous birds foraging in the same forests at lower levels. This implies that the protective function of these flocks may not apply equally to different groupings of species.

Particularly during the non-breeding season, starlings gather at night in roosts which may encompass only small groups, but often thousands or even hundreds of thousands of birds drawn from a wide area. Dry-season roosts of Splendid Glossy Starlings in Gabon are reported as holding tens of thousands of individuals, and some of the rural roosts of Common Starlings in Europe have been estimated to number some two million birds, while in Israel they are even estimated at up to eight million. For most starling species, nothing is known about the internal organization of these roosts: information is lacking on how closely the birds are clustered together, whether individuals preferentially roost near familiar conspecifics, and whether the sexes and the age-classes are separated.

Studies of the Common Starling have revealed that the huge winter roosts of this species are by no means a random accumulation of individuals, as there are significant associations between birds which sing a common dialect and perch close together each night. In these large winter roosts of Common Starlings there is also segregation of both sexes and ages, adult males being predominant in the centre and younger females resorting to more peripheral parts of the roost site. This distribution results from competition, involving posturing and overt aggression among individuals, for the available perching spaces. Departure for the feeding areas during the early morning is a complex affair, major exoduses of starlings from the roost taking place at approximately three-minute intervals, the adult males departing first and younger females later. Roosts are often regarded as secure sleeping places, where the birds are safe from attack by predators. For this species, however, temperature also plays a role. In rural woodlands the Common Starlings tend to select warmer, less windy locations, and urban localities are significantly warmer than surrounding rural areas during the coldest winter months; for starlings needing to forage every day in order to maintain their energy balance, this can be crucial for their survival. Under extremely cold conditions, the usual inter-individual distance maintained by roosting individuals is reduced and the birds sometimes huddle together.

The complex aerial gyrations of Common Starlings prior to settling in the roost certainly look like a predator-avoidance strategy, and the extraordinary patterns created by these flocks, and



Outside the breeding season, ***Common Starlings*** *will gather from a wide area to join communal roosts. The birds may come from a radius of more than 50 km, and on occasions up to 120 km. Common Starlings are considered one of the most abundant bird species in the world, and the roosts can include thousands or even hundreds of thousands of birds. Some rural roosts of Common Starlings in Europe have been estimated to contain more than two million birds. Similarly, dry-season roosts of Splendid Glossy Starlings* (Lamprotornis splendidus) *in Gabon are reported as holding tens of thousands of individuals. The extraordinary patterns created by flocks of Common Starlings as they manoeuvre about have led mathematicians to develop numerical models to try to understand them. Their work indicates that the ability of all the birds in the flock to act as one, turning together on an instant without collisions, could emerge from simple local rules of interaction between the individual birds. The implication of one study (which does not mention starlings) is that rather than monitoring all the birds within a given radius, each bird keeps track of the current positions of six or seven individuals which are separated from it by a fixed number of other birds. The critical distance is thus topological, dependent on the structure of the surroundings, and not a simple linear measure of separation. Modelling of the process suggests that flocks organized on this principle are much more stable against perturbations, such as the attack of a predator, and are much less likely to split up and leave some individuals temporarily isolated and vulnerable.*

[*Sturnus vulgaris vulgaris*, Djerba, Tunisia. Photos: Manfred Pfefferle]



Flocking increases the chances of individual survival, and also enables smaller birds to use their numbers to drive away predators. ***Common Starlings****, here seeing off a male Western Marsh-harrier* (Circus aeruginosus)*, give a short, metallic "chip" call on sighting a predator. Studies of the Common Starling have revealed that their huge winter roosts are not random accumulations of individuals. There are significant associations between birds which sing a common dialect and perch close together each night. Roosts are often regarded simply as secure sleeping places, where the birds are safe from attack by predators, but in winter Common Starlings also select warmer, less windy locations, including urban sites.*

[*Sturnus vulgaris vulgaris*, Rhineland-Palatinate, Germany. Photo: Manfred Pfefferle]

the control exhibited by the lack of collisions, have intrigued all observers who have witnessed them. Mathematicians have also puzzled over the spectacle, and their numerical models have indicated that such collective behaviour could emerge from simple local rules of interaction among the individual birds. Recently, a multi-author paper with a forbidding title, which does not mention starlings, proposed that the interaction in such flocks does not depend on the metric distance between birds, which had been the general working assumption, but, rather, on the topological distance between them. In practical terms, this implies that each bird, rather than monitoring all the birds within a given radius, keeps track of the current positions of six or seven individuals which are separated from it by a fixed number of other birds. The critical distance is thus topological, dependent on the structure of the surroundings, and not a simple linear measure of separation. Modelling of the process suggests that flocks organized on this principle are much more stable against perturbations, such as the attack of a predator, and are much less likely to split up and leave some individuals temporarily isolated and vulnerable. So, starlings can be as instructive in mathematics as they are in music (see Relationship with Man).

Most starlings seem to enjoy bathing in water, and some of the smaller species will also bathe in wet foliage. For Common Starlings, bathing is an important activity in pre-roost assemblies. All members of the family drink by sipping, raising the head to swallow, and Common Mynas have been recorded even as drinking hot seawater from pools in the upper tidal zone in the tropics.

Dust-bathing has not been reported for any sturnid species, but "anting", another activity possibly associated with plumage care, has been. Active anting, in which a bird picks up ants in the bill and "wipes" them through selected areas of the plumage, has been observed to be performed in the wild by three African and three Asian species, and there are records of anting by five African and eleven Asian sturnids in captivity. Passive anting, whereby a bird on the ground takes up a posture with wings spread, resembling the sun-bathing attitude, and allows ants to crawl through its plumage, is common among some corvids, such as the Eurasian Jay (*Garrulus glandarius*); this behaviour, however, has not hitherto been recorded for any starling species. The ants utilized are always members of the subfamily Formicinae, which release large amounts of formic acid when molested. There have been observations of starlings indulging in anting behaviour but using, instead, millipedes (Diplopoda), which produce volatile defensive secretions, and even of individuals employing other strong-smelling materials, such as mothballs. Since formic acid, when applied directly in the laboratory, is found to be toxic both to insects and to micro-organisms which may grow on the feathers, anting has often been regarded as a technique for ridding the plumage of ectoparasites. There is, however, no direct evidence that anting, as performed by the birds, does kill any ectoparasites, and in experimental studies it is striking that some individuals indulge in anting at every opportunity, whereas others do so seldom or never, and there is no apparent correlation with the extent of infestation with ectoparasites. This has led to speculation that birds may undertake this activity merely for sensory stimulation, and that it may represent behaviour akin to glue-sniffing or other forms of drug addiction among humans. Perhaps new techniques for recording the brain activity of anting birds will bring us closer to an answer to the question.

Preening forms an essential part of plumage maintenance, and all starlings spend part of their day in this activity. Allopreening, in which an individual grooms a partner of the same species, is an important element in the social behaviour of several species, and is usually directed at the head region. This behaviour is likely to be practised by starlings having long-term pair-bonds, and it has been noted for the Grosbeak Starling, the Black-winged Myna, the Bali Myna, the Black-collared Starling and the Red-winged Starling.

All starlings scratch by employing the indirect method, whereby they lower one wing and lift the leg on the corresponding side, and then reach over the wing in order to scratch the head. Starlings probably have good reason to scratch, as their nests are often infested with biting lice (Mallophaga) and mites (Acarina). In Africa, birds occasionally have ticks (Ixodoidea), sometimes engorged, on the head area; the starlings seem to be incidental hosts to these ticks, which are species normally affecting hares (*Lepus*) and other small ground-living mammals, rather than birds. Hippoboscid flies (Hippoboscidae), a dipteran family

the members of which have a flattened body and adhesive feet and which includes well-known agricultural pests such as sheep keds, can occasionally be seen as they scurry through the starling's feathers, particularly on the wings. Internal parasites include tapeworms (Cestoda) and roundworms (Nematoda); a recent report has attributed deaths of wild Wattled Starlings to the physical damage caused by the nematode *Diplotriaenia verminosis*. Starlings, as well as other birds, can be hosts to blood parasites, including avian malaria and West Nile Virus, both of which are transmitted by mosquitoes (Culicidae). At least in the United States, the introduced Common Starling seems to be a minor carrier of West Nile Virus, and does not itself suffer high mortality when infected.

Allofeeding, whereby birds feed members of the group which are neither their mates nor their offspring, is an unusual type of behaviour, and one which may serve to reinforce alliances between individuals. Observations of the African Pied Starling revealed that subadults were the most active age-class in allofeeding, but that food exchanges could occur between individuals of all ages, including the feeding of an adult by a juvenile. The genetic relatedness of the individuals was not known in this study, but most exchanges involved birds which had been helpers at the same nests in the previous breeding season. The donor appeared to have selected its chosen beneficiary in advance, and on finding a food item, typically a large insect, it would adopt a very upright posture and strut purposefully towards the other bird. Other African Pied Starlings which approached it en route were brushed aside until, finally, the recipient would crouch and receive the food. In a few cases in which the recipient did not respond appropriately, the donor would itself swallow the food. No other starling species have been reported allofeeding, but it may occur among some of the co-operative breeders which associate in groups throughout the year (see Breeding).

Voice

Starlings are not usually rated as great songsters compared with such bird families as the thrushes, whose voices seem more musical to the human ear. J. P. Chapin described groups of Splendid Glossy Starlings as gathering "to practise the most marvellous discords", and although many members of the family are highly vocal, they have received scant praise from the poets. A common feature of both African and Asian starlings is that they will gather in such groups, often termed "choirs" by the observers, and sing for extended periods. In Africa this is commonly in temporary aggregations during the hottest hours of the day, whereas some Asian species, such as the Common and White-vented Mynas (*Acridotheres javanicus*), are particularly vocal at their night-time roosts. Both sexes apparently participate, and in the case of the Common Starling song at the roost seems to play a role in the defence of favoured perches. It is not clear, however, what other functions such choruses may have in the social organization of the species concerned.

In common with many other bird species, male starlings sing in order to advertise their territories, both to females and to rival males, and to attract mates. These functions of song have been confirmed experimentally for the Common and Spotless Starlings, and can be expected to apply to many other sturnids. In cases when pair-members remain together for more than a single breeding season, specific calls would be expected to serve for communication between the partners; duetting has been reported for Brahminy Starlings and for Rüppell's Glossy Starlings. A field study of the vocalizations of the Red-winged Starling in South Africa has revealed interesting similarities to the Common Starling, both species having two main types of song, namely whistles and warbles. But there were also also striking differences, the Red-winged Starling's repertoire including notes used exclusively by males or by females but hardly any songs that are unique to a particular individual. These two species have very different social systems: the Red-winged Starling maintains a long-term pair-bond and the pair lives in an exclusive individual territory, whereas the Common Starling has a short-term pair-bond and a tendency towards colonial breeding.

For most species in the family, the full vocal repertoire has still to be described, and it is not possible to make any general statements about the ways in which the songs may be developed by young sturnids. Field and laboratory studies of the Common



Some members of Sturnidae are more aggressive than others. Among the mynas, ***Common Mynas*** *are notorious for their aggressiveness, both to one another, and to birds of other species. Fights may take place between individuals, or between groups. Following a chase, the birds may interlock their claws and peck at each other. In places where Common Mynas have been introduced, they tend to drive away less aggressive native hole-nesting species. Indeed, this species may have been responsible for driving the Rarotonga Starling* (Aplonis cinerascens) *from the lowlands of Rarotonga.*

[*Acridotheres tristis*, Berenty Reserve, Madagascar. Photo: Cyril Ruoso/Bios]



Preening forms an essential part of plumage maintenance, and all starlings spend part of their day in this activity. Mutual preening, or allopreening, in which an individual grooms a partner of the same species, is also an important element in the social behaviour of several species. Allopreening is usually directed at the head region, including the bare skin around the eye. Allopreening is usually considered evidence that pair-bonds in a species are likely to be long-term. It has been recorded in the ***Common Hill Myna****, which in the wild certainly pairs for several successive seasons, and may pair for life. It has also been noted in six other sturnids. A perhaps more unusual type of behaviour is allofeeding, whereby birds feed members of the group which are neither their mates nor their offspring. Allofeeding may serve to reinforce alliances between individuals. Observations of the African Pied Starling* (Lamprotornis bicolor) *revealed that subadults were the most active age-class in allofeeding, but that food exchanges could occur between individuals of all ages, including the feeding of an adult by a juvenile. Most exchanges in this study involved birds which had been helpers at the same nests in the previous breeding season. No other starling species has been reported allofeeding, but the phenomenon may occur among some of the co-operative breeders which associate in groups throughout the year.*

[*Gracula religiosa*. Photo: Luis Casiano]



*In stretching its wing, this **Red-cheeked Starling** is revealing its prominent white wingbar. Wing-stretching plays a small part in the time devoted to feather maintenance, and may simply be a way of easing tired muscles. Among different approaches to feather care, dust-bathing has not been reported for any sturnid species, but "anting" has been. Active anting, in which a bird picks up ants in the bill and "wipes" them through selected areas of the plumage, has been observed in the wild in three African and three Asian species, and in captivity in five African and eleven Asian sturnids. The ants used are always members of the subfamily Formicinae, which release large amounts of formic acid when molested. Since formic acid, when applied directly in the laboratory, is toxic both to insects and to micro-organisms which may grow on the feathers, anting has often been regarded as a technique for ridding the plumage of ectoparasites. There is, however, no direct evidence that anting kills ectoparasites, and in experimental studies it is striking that while some individuals indulge in anting at every opportunity, others seldom or never do so. There is also no apparent correlation with the extent of infestation with ectoparasites. This has led to speculation that birds may undertake this activity merely for sensory stimulation. There have been observations of starlings indulging in anting-style behaviour using, millipedes (Diplopoda), which produce volatile defensive secretions, and even of individuals employing strong-smelling materials such as mothballs.*

[*Agropsar philippensis*, Higashine, Yamagata-ken, Japan.
Photo: Hirozo Maki]



The feet are used to groom feathers which are beyond the reach of the bill, and also to remove ectoparasites. All starlings scratch the head in the way this ***Ashy Starling*** *is doing, by lowering one wing and lifting the leg over the wing to scratch. Starlings probably have good reason to scratch, as their nests are often infested with biting lice (Mallophaga) and mites (Acarina). In Africa, starlings occasionally have ticks (Ixodoidea), sometimes engorged, on the head area. The starlings seem to be incidental hosts to these ticks, which are species normally affecting hares* (Lepus) *and other small ground-living mammals. The Ashy Starling is confined to the interior of Tanzania, where it is common, and occurs in several national parks.*

[*Lamprotornis unicolor*, Tarangire National Park, Tanzania. Photo: Ketil Knudsen]

Starling make this one of the best-known of all bird species in terms of song acquisition and singing behaviour, and even the brain regions controlling particular aspects of vocalization have now been defined. Males continue to acquire new songs for at least eight years, and it seems that individual repertoires are restructured annually to some extent. Learning is dependent on a close association with the tutors, whether conspecifics or human care-givers, and male Common Starlings normally learn exclusively from other male starlings, whereas females acquire their song elements from other females. Females in the wild sing much less than males, and this appears to be influenced chiefly by sex hormones, but the social environment and the availability of nest sites are also important factors.

Vocal mimicry by birds remains a puzzling phenomenon, one for which there is no generally accepted functional explanation. Some starlings are highly accomplished mimics, incorporating into their repertoire the vocalizations of other birds and other animals, as well as human speech and whistles, and even artificial sounds such as those made by hammers, bells, machines, telephones and so on. Mimicry by the Common Starling has been studied in some detail, and similar patterns were found for individuals from Scotland, England, France, Germany and New Zealand. Certain species are imitated by Common Starlings much more frequently than are others, and this is not always a reflection of their abundance in the area, so that particular types of call or song are evidently favoured as models. Simple, pure calls are reproduced very accurately in whistling song, whereas the sounds imitated in warbling song are often modified and combined in complex sequences, with a great deal of individual variation. Imitations of the songs of other bird species have been reported also for the Shining Starling (*Aplonis metallica*), the Spotless Starling, the Brahminy Starling, the Common Myna, the Crested Myna (*Acridotheres cristatellus*), the Asian Pied Starling, and the Cape Glossy, Black-bellied Glossy and Splendid Glossy Starlings, as well as for the Amethyst Starling in captivity, while accurate imitation of the human voice is known to be accomplished by the Common Starling, the Common Myna, four hill mynas in the genus *Gracula*, and one African species, the Splendid Glossy Starling. The last-mentioned also reproduces the calls of monkeys. Mimicry could be a means of increasing the vocal repertoire of individual birds, but it may be merely a side effect of the extended learning period associated with the acquisition of complex songs.

Apart from songs, calls serve a very important function in communication. Flight calls are believed to contribute to the coordination of the movements of flock-members, while alarm calls are often mutually recognizable among species. In East Africa, Superb Starlings (*Lamprotornis superbus*), which forage mainly on the ground, have discrete alarm calls for aerial predators, snakes, and other ground-based predators. Vervet monkeys (*Cercophithecus aethiops*), which frequently feed alongside the starlings, recognize these different alarm calls and respond appropriately to them; young monkeys appear to learn the significance of the starling calls by observing the adults in the troop. Experimental studies of Common Mynas suggest that, while alarm calls associated with a potential predator are quickly learnt by naive birds, distress calls, such as those given by individuals held in the hand, are not necessarily associated with anti-predator responses. Vocal learning, even for apparently simple signals, may present unexpected subtleties for these starlings.

Food and Feeding

Starlings are generally categorized as frugivores or insectivores, yet some take a wide range of animal food up to the size of small vertebrates, as well as fruit and other vegetable material, so that they could be described, rather, as omnivores. There are clearly



Sunbathing may be part of the suite of feather maintenance activities. The warmth of the sun may make the feathers more flexible prior to preening, or may bring parasites to the surface where they can more easily be removed. This ***Hildebrandt's Starling*** *has fully spread the feathers of its wings and tail, and raised the feathers of its back and throat, enabling the warmth to penetrate. Some corvids, such as the Eurasian Jay* (Garrulus glandarius) *adopt the sunbathing posture while allowing ants to crawl through their feathers. But this behaviour, known as "passive anting", has not been recorded in any starling species.*

[*Lamprotornis hildebrandti*, Serengeti National Park, Tanzania.
Photo: Ketil Knudsen]

seasonal differences, too, in the diet, with a predominance of animal food during the breeding season. Many starling species will take nectar, in southern Africa particularly from the aloes (*Aloe*) which flower in winter, when other food may be scarce. Red-winged Starlings, African Pied Starlings and Cape Glossy Starlings are regular visitors to such aloe patches, and the introduced Common Starling is occasionally present, along with the Wattled Starling. On the dark plumage of most of these species, the bright orange pollen is highly conspicuous. The role of starlings in pollination of the aloes is unclear, but the brush-tipped tongue possessed by the Madagascan Starling and some Asian species, such as the Brahminy Starling (see Morphological Aspects), suggests that mutual adaptations between plants and their starling pollinators may have occurred. This possibility is reinforced by the frequency with which the crests of some *Acridotheres* mynas are covered with pollen when the birds are taking nectar from the flowers of such trees as *Bombax* and *Erythrina*. On the alpine moors of East Africa, where few other birds or insects venture, the Slender-billed Starling appears to be an important pollinator of the giant lobelias (Campanulaceae).

A wide range of cultivated and wild fruits is eaten by starlings, and studies in both Africa and Asia have confirmed that starlings are significant dispersal agents for several native tree species, such as the West African *Boscia senegalensis* and *Ster-*



For ***Common Starlings****, bathing is an important activity in pre-roost assemblies. They splash vigorously, plunging their heads under the water, flapping their wings and flinging the spray over themselves, until the feathers appear completely saturated and stand up in matted clumps. Bathing may be followed by a quick, cursory preen while the bird is still on the ground. Most starlings seem to enjoy bathing in water, and some of the smaller species will also bathe in wet foliage.*

[*Sturnus vulgaris vulgaris*, Hungary.
Photo: Markus Varesvuo]



Male starlings sing to advertise their territories and attract mates. These functions have been confirmed experimentally for the Common (Sturnus vulgaris) *and* ***Spotless Starling****. Male Spotless Starlings sing in most months, while both sexes sing in winter, and at the roost. The song consists of whistles and warbling phrases, with mimicry of at least 15 other species. The Spotless Starling song is similar to that of the Common Starling, which is one of the most studied bird species in terms of song acquisition. Male Common Starlings continue to acquire new songs for at least eight years, and normally learn from other males, while females learn from other females.*

[*Sturnus unicolor*, Puerto de Santa Cruz, Cáceres, Spain. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]

culia quinqueloba in Malawi and, in Asia, the Indian banyan (*Ficus benghalensis*), white sandalwood (*Santalum album*) and neem (*Azadirachta indica*). The parasitic mistletoe *Phragmanthera dschallensis* in South Africa is bird-dispersed, with the Amethyst Starling one of its most effective distribution agents. A review of frugivory in the Oriental Region concluded that starlings of the genera *Aplonis*, *Acridotheres*, *Sturnia* and *Gracupica* are today probably the most abundant frugivorous vertebrates in many human-dominated landscapes, and thus play a crucial role in pollination and seed dispersal.

In South Africa, the native Red-winged Starling is considered an important disperser of the invasive Australian species *Acacia cyclops*, locally known as "*rooikrans*" because of the red (*rooi*) aril, attractive to the birds, which forms a wreath (*krans*) around the seed. Conversely, in Australia, the introduced Common Starling and Common Myna are important dispersal agents of the alien olive (*Olea europaea*) and, in the case of the Common Starling, olive stones may be transported over distances of up to 40 km. Observations of starlings feeding on over-ripe and fermenting fruit led to speculation that the birds might become intoxicated from the alcohol content. Laboratory experiments with Common Starlings demonstrated, however, that this species, at least, has at its disposal enzymes which break down alcohol very rapidly, so that even individuals provided with high concentra-



Despite its name, New Guinea's ***Singing Starling*** *is not a great songster, whether it be adult or, as here, immature. Its song is a short, melodious whistle. Other species make up in vigour and variety what they lack in tunefulness. Some gather in "choirs", and sing for extended periods. In Africa this is commonly during the hottest hours of the day, whereas some Asian species, such as the Common* (Acridotheres tristis) *and White-vented Mynas* (A. javanicus)*, are particularly vocal at their roosts.*

[*Aplonis cantoroides*, Port Moresby, SE New Guinea. Photo: Brian J. Coates]



*The song of the **Bristle-crowned Starling** is a complex of pure, musical whistles and warbling notes. Some starlings are highly accomplished mimics. Simple, pure calls are reproduced very accurately in whistling song, whereas the sounds imitated in warbling song are often modified and combined in complex sequences, with a great deal of individual variation. Non-bird sounds, such as the calls of monkeys, telephones and human speech, may be mimicked. There is no generally accepted functional explanation for mimicry. It could be a means of increasing the vocal repertoire of individual birds, but may just be a side effect of the extended learning period associated with the acquisition of complex songs.*

[*Onychognathus salvadorii*, Sof Omar, Ethiopia. Photo: Ketil Knudsen]

tions of ethyl alcohol in their diet showed no change in blood alcohol levels.

Anting, referred to earlier with regard to plumage care (see General Habits), has also been described as a technique for ridding these insects of the distasteful formic acid before consuming them. The Common Starling does eat ants, as well as anting enthusiastically, yet the two actions are not always associated, and there is little support for this explanation of anting behaviour. Other species, such as the African Pied Starling, may eat large numbers of ants but have never been observed to perform anting. Many starlings will hawk flying insects and termite alates (Isoptera); the latter, the winged reproductive termites which emerge during rainy periods, are a favourite bird food throughout Africa, eaten by almost any species. On the ground, starlings pursue other arthropods, including spiders (Araneae), sun-spiders (Solifugida) and centipedes (Chilopoda), and a few sturnids will feed on millipedes, which are often rejected as distasteful by both bird and mammal predators. Individuals foraging in the intertidal zone take worms (Annelida), snails and limpets (Mollusca), small crabs (Decapoda) and beach hoppers (Amphipoda).

Vertebrate prey include fish, which are caught in shallow pools, as well as small reptiles and amphibians, nestling birds, and probably also small rodents. Several ornithologists in Africa have noted that "bal-chatri traps", small cages festooned with nooses put out for raptors and shrikes (Laniidae) and baited with live mice (Muridae), immediately attract some of the larger starling species. Some sturnids, such as the African Pied Starling and Red-winged Starling, will also eat carrion, including vertebrates killed on roads, and meat on carcases at abattoirs.

Particularly when feeding young, Red-winged Starlings break up large prey items such as millipedes and solifugids by bashing them on stones, which serve as regular "anvil" sites. Similar behaviour has been reported for the Socotra Starling (*Onychognathus frater*) and Tristram's Starling (*Onychognathus tristramii*), and is quite likely to be employed by other species.

A few members of the family are known to puncture and eat the eggs of other birds. Indeed, both the Common Starling and the Common Myna are considered significant egg predators at seabird colonies on some oceanic islands. On the Azores, in the east Atlantic Ocean, where Common Starlings are responsible for significant egg losses at a Roseate Tern (*Sterna dougallii*) colony, quail (Phasianidae) eggs treated with methiocarb were deployed in a taste-aversion experiment. The starlings, however, then avoided quail eggs but continued to eat tern eggs, suggesting that a modified approach will be needed if the starlings are to be dissuaded from pursuing this diet. Both adults and nestlings of several species, including swifts (Apodidae), swallows (Hirundinidae) and members of the thrush family (Turdidae), have been attacked and killed by nesting Red-winged Starlings, but



*Starlings are generally categorized as frugivores or insectivores. But many, like the **Asian Pied Starling**, take such a wide variety of food types that they are perhaps better described as omnivores. Food can include fruit, flowers, nectar, seeds and cultivated cereal grains, and animal prey such as frogs, worms, snails, spiders and ticks, as well as insects of many kinds and sizes. The Asian Pied Starling forages primarily on the ground, in marshy grassland with scattered trees, often near cultivated areas and human habitation, or at sewage farms and rubbish dumps. It is usually found in pairs or in small parties of up to six individuals, although outside the breeding season, it may forage in larger groups of up to 30.*

[*Gracupica contra floweri*, Bangkok, Thailand. Photo: Tom Stephenson]



Although the two oxpecker (Buphagus) *species are now considered to lie outside the true starling lineage, a number of African and Asian starling species share the oxpecker habit of perching on wild mammals or livestock and removing ticks from them. This behaviour is particularly common among mynas. The* ***Great Myna*** *is so often seen perching on the water buffalo* (Bubalus) *that it has acquired the alternative name of "Buffalo Myna". Collared Mynas* (Acridotheres albocinctus) *are sometimes found in mixed flocks with Great Mynas around herds of livestock. In true oxpecker style, Bank Mynas* (A. ginginianus) *perch on cattle and remove ticks from them. As well as gleaning ectoparasites from their skins, Great Mynas use the large animals as beaters, and catch the insects they disturb as they move through the grass. Crested Mynas* (A. cristatellus) *also perch on the backs of buffaloes, from where they collect and hawk insects. Pale-bellied Mynas* (A. cinereus) *are usually found foraging on or around cattle, and Jungle Mynas* (A. fuscus) *similarly frequent grasslands grazed by cattle, and perch on their backs to hawk insects disturbed by them. In Africa, Greater Blue-eared Starlings* (Lamprotornis chalybaeus) *are often to be found perched on the backs of African buffaloes* (Syncerus caffer).

[*Acridotheres grandis*, N Thailand. Photo: Neil Bowman/FLPA]



Oxpecker-like behaviour is not only tolerated by many mammals, but apparently even welcomed by them, presumably because of the relief from discomfort which the removal of ectoparasites brings. In Israel, for example, both wild Nubian ibexes (Capra ibex) *and camels* (Camelus) *will visit regular sites, where they are systematically inspected by* ***Tristram's Starlings****. There is even an apparent mutual exchange of signals between the starlings and the ibexes. Tristram's Starlings are found in desolate rocky areas in deserts, and are apparently physiologically adapted to such conditions. They make opportunistic use of what resources are available, and have established themselves in towns, while those breeding outside urban areas may visit towns in order to forage, scavenging bread and dog food from houses. Tristram's Starlings have also been observed to pluck ticks from the hides of donkeys. The Red-winged Starling* (Onychognathus morio)*, Somali Starling* (O. blythii)*, Cape Glossy Starling* (Lamprotornis nitens) *and African Pied Starling* (L. bicolor) *have all been seen to remove ticks and other ectoparasites from domestic animals. Careful observation is necessary, however, because some birds use mammals simply as perches, from which they hawk insects, or drop down to the ground to catch insects disturbed by the passage of the mammals.*

[*Onychognathus tristramii*, Khawr Rawri, Oman. Photo: Hanne & Jens Eriksen]



Primarily insectivorous, ***Wattled Starlings*** *forage in association with wild and domestic ungulates. They perch on species such as Burchell's zebra* (Equus burchellii), *the white rhinoceros* (Ceratotherium simum), *and the blue wildebeest* (Connochaetes taurinus), *and may remove ectoparasites from them, and from sheep. Wattled Starlings also associate with African elephants* (Loxodonta africana), *but are displaced whenever they attempt to perch on them. Elephants have also been observed to reject the attentions of oxpeckers* (Buphagus), *suggesting that their skin may be more sensitive than might be expected. Meves's Long-tailed Starlings* (Lamprotornis mevesii) *follow moving elephants, catching insects disturbed by them.*

[*Creatophora cinerea*, Masai Mara National Park, Kenya. Photo: Michel & Christine Denis-Huot/Bios]

this appears to occur as an expression of interspecific territorial defence, rather than as predation.

Some birds are able to extract subterranean insects and worms from the grass mat by a specialized form of prying or open-bill probing, a method termed "*Zirkeln*" in the German literature, in which the closed bill is forced into the ground and then opened by specially strengthened jaw muscles. Within Sturnidae, this method of food-seeking is most highly developed in the Eurasian genera *Sturnus*, *Pastor* and *Agropsar* and some members of *Acridotheres*, *Poliopsar* and *Sturnia*, as well as in their African relative *Creatophora*. It has certainly preadapted these species for the exploitation of lawns, sports fields, and meadows closely grazed by domestic stock. A tame Common Starling often used this technique in order to open household objects such as matchboxes, and it would also try to force apart the fingers of its human keeper to gain access to hidden food.

Although the two oxpecker species, formerly treated as sturnids, are now considered to lie outside the true starling lineage (see Systematics), the oxpecker habit of perching on wild mammals and removing ticks from them has been reported also for several starling species in Africa and Asia. This behaviour is apparently tolerated by the mammals, which may even "welcome" it. In Israel, for example, both wild Nubian ibexes (*Capra ibex*) and camels (*Camelus*) will visit regular sites where they are systematically groomed by Tristram's Starlings. Similarly, in Africa, a small antelope of rocky hills, the klipspringer (*Oreotragus oreotragus*), appears to have a regular grooming relationship with Red-winged and Pale-winged Starlings, which are sympatric with the klipspringer in different parts of this antelope's range. The Great Myna (*Acridotheres grandis*), Common Myna, Jungle Myna (*Acridotheres fuscus*), Spotless Starling, Wattled Starling, Red-winged Starling, Somali Starling, Cape Glossy Starling and African Pied Starling have all been seen to remove ticks and other ectoparasites from domestic animals, and some probably feed in the same way from wild ungulates. Careful observation is necessary, however, as some birds clearly use mammals simply as perches, from which they hawk insects, or from which they drop to the ground to catch insects disturbed by the mammals.

Starlings which co-exist with humans have quickly learnt to exploit the food opportunities that people provide. Apart from their depredations in orchards and cropland, species such as the Common Starling may have a significant impact at feedlots for cattle. At picnic sites in game reserves in Africa, starlings of several species will gather for hand-outs. The Red-winged Starlings on the campus of University of Cape Town, in South Africa, do not merely check the radiator grilles of parked vehicles for trapped insects, but resident pairs routinely enter buildings to reach the student canteen and the dining halls, even where this entails that they follow passageways with only artificial lighting; the birds collect food items from unattended plates and then generally carry these outside to be eaten. After sunset, starlings will even hunt insects attracted to streetlights. Moreover, at some motorway service stations in the UK, Common Starlings have learnt that the front number plates and surrounding areas of cars provide an abundant source of freshly killed insects, especially in summer. This behaviour does seem to be specific to only a few of the country's many service stations, possibly indicating that it spreads through cultural transmission. Common Starlings feed frequently at sewage-treatment plants and refuse dumps, a habit which has led to some people becoming concerned about their potential for disease transmission.

Breeding

Starlings are often considered to be typically hole-nesting birds, utilizing natural tree holes and also cavities made by woodpeckers or barbets, as well as equivalent spaces in artificial structures such as walls and roofs and, in a few cases, tunnels excavated in the banks of rivers or dry gulleys. A number of sturnids, however, also build free-standing nests, which can be either domed constructions or open cup-nests. The nests may be scattered in individual territories, each occupied by a single pair, or they may be clustered in dense colonies. Some starlings exhibit a wide range of different nest-site choices, and also vary markedly with regard to their breeding densities in different situations.

Throughout the range of the family, most forest starlings are hole-nesters, although the Grosbeak Starling is the only member of the family with the ability to excavate its own nest-sites in timber. With its powerful bill and colonial habits, this species can weaken dead trees to the point at which they break; its nest has an entrance of about 4 cm in diameter, with a cavity extending downwards at an angle for up to 30 cm into the trunk. Another colonial forest-dweller is the Narrow-tailed Starling (*Poeoptera lugubris*), but it is dependent on colonial African barbets in the genus *Gymnobucco* for the provision of nest-sites. Surprisingly, several observers have reported that both the barbets and the starlings may be present at the nesting trees at the same time, and apparently share the facilities quite amicably. Whereas most of the African red-winged starlings in the genus *Onychognathus* nest in rocky areas, there is a short-tailed representative in montane forests, Waller's Starling (*Onychognathus walleri*), and a long-tailed relative in lowland rainforest, the Chestnut-winged Starling (*Onychognathus fulgidus*), both of which nest in tree holes within large territories, well separated from other nesting pairs.

Shining Starlings and Yellow-eyed Starlings (*Aplonis mystacea*) are both colonial forest birds, their nests usually concentrated in a single tree. These nests, of which there are often more than 100 at a single site, are globe-shaped structures suspended from the upper branches. Other *Aplonis* species nest mainly in tree holes, exceptions being the colonial White-eyed Starling, which builds tunnel-like nests among the epiphytes on branches in the canopy, and the Brown-winged Starling (*Aplonis grandis*), isolated pairs of which place a bulky nest in the fork of a tree or at the end of a broken branch. The nest-sites of a number of Asian forest starlings have apparently never been described.

Among the Asian starlings and mynas of more open country, a much broader interpretation of "nesting hole" is evident, and many species will use a wide range of both natural and artificial sites. Thus, Rose-coloured Starlings most frequently nest in the interstices between stones on scree slopes, but also use cracks in rocks, clefts in cliffs, holes in buildings, under roofs and in roof thatch, burrows constructed by Collared Sand Martins (*Riparia riparia*) and even holes in willow trees (*Salix*). More urbanized species, such as the Common Myna, nest in lampposts, air-conditioning vents, and abandoned vehicles and machinery. There is even a report of a pair of White-vented Mynas in Singapore which nested in a bus which was still in use for routine journeys. The habit of constructing tunnels in the soil is, however, restricted to a few species, notably the Bank Myna (*Acridotheres ginginianus*); rarely, Common Starlings, too, have been recorded as excavating their own holes in sand dunes. The nests of Asian Pied Starlings are domed and may be built on artificial structures, such as streetlamps, as well as in trees. They can be very bulky structures, dimensions of 60–80 cm across by 35–50 cm high having been recorded. Domed nests in trees, well protected by thorns, are the norm for several African species, such as the Superb Starling, the Chestnut-bellied Starling, Fischer's Starling (*Lamprotornis fischeri*), the White-crowned Starling and the Wattled Starling, the extensive colonies of which may include many nests clustered together in both indigenous thorn trees and exotic vegetation, including pine trees (*Pinus*) and gum trees (*Eucalyptus*).

The addition of mud to the nest structure, as opposed to the building of a nest entirely from mud, is an unusual technique among birds generally, and among the starlings it is restricted to some members of the genus *Onychognathus*, the African red-winged starlings, which build cup-nests on rocky ledges. All known nest-sites of the Slender-billed Starling have been in caves behind waterfalls with mud readily available, whereas the Pale-winged Starling, in the arid regions which it frequents, places its nests deep within rock clefts and does not use any mud. Most other Afrotropical starlings occupy tree holes, whether in forest or in savanna. Two species utilize tunnels in the soil. One of these, the Magpie Starling (*Speculipastor bicolor*), normally burrows into termite mounds, but it sometimes digs holes in riverbanks. The other, the African Pied Starling, can make its own tunnels in riverbanks and gulleys, but nowadays it often uses spaces in stone walls, gaps under the eaves of houses, and other opportunities presented by man-made structures.

Whether the nests are in holes or are free-standing, they may contain material from a variety of sources, including moss, grass, twigs, leaves, flowers, feathers, hair and wool, sloughed snakeskins, dung, wire, string, paper and plastics. Particular attention has been focused on the use of green leaves. These are often taken from aromatic plants, and it was proposed that they might serve as a natural insect-repellent agent, reducing the



In Namibia and South Africa, ***Pale-winged Starlings*** *regularly perch on klipspringers* (Oreotragus oreotragus) *and remove ectoparasites. The starlings are at least tolerated by the antelopes, and, in fact, appear to have a regular relationship with them. A similar relationship exists between the klipspringer and the Red-winged Starling* (Onychognathus morio), *which is sympatric with the antelope elsewhere in its range. Red-winged Starlings not only remove ticks, but may feed on secretions from the klipspringer's pre-orbital glands. The Pale-winged Starling also removes ticks from two species of mountain zebra* (Equus) *and from desert-dwelling giraffes* (Giraffa camelopardalis) *in Namibia.*

[*Onychognathus nabouroup*, Augrabies Falls National Park, South Africa. Photo: Oriol Alamany]

number of ectoparasites and thus improving the survival of the young. Most of the experimental work in this field has concentrated on the Common Starling. It seems clear that males of this species bring in green leaves during the courtship phase, before even eggs are present in the nest, and that the behaviour, therefore, represents a display directed at the female, rather than fumigation for the benefit of the nestlings. Leaves of certain plants are preferred, and there is evidence that male Common Starlings exhibit increased olfactory sensitivity during the breeding season, when fresh plant material is being brought to the nests. There seems, however, to be little convincing evidence that the presence of these leaves has any impact on the population of biting arthropods at a later date. Recent studies have raised the intriguing possibility that the young starlings might gain an unexpected advantage, since it appeared that, in nests with added aromatics, the chicks' immune systems were boosted, and the nestlings suffered less from insect bites and potential disease transmission. In the case of the Spotless Starling, the amount of green material contributed by the male seems also to advertise his quality as a mate. In turn, the female Spotless Starling brings in feathers and places them alongside the nest cup, such that they serve no purpose in insulation, but potentially provide a measure of her physical condition and experience. Fresh green leaves have been noted in the nests of several African starlings, but there are no experimental data which could perhaps indicate the functional significance of this behaviour for any of these species.

Confined nest-holes pose problems of space, and pollution from droppings and waste material from food, as well as ecto-



*These **Jungle Mynas** are using an Indian rhinoceros* (Rhinoceros unicornis) *to flush insects. India's Kaziranga National Park has the world's largest remaining population of these mammals, which are listed as Vulnerable by IUCN. When foraging on the ground, the Jungle Myna uses open-bill probing to collect insects in the grass. Jungle Mynas also feed on fruits and seeds, including cereals and groundnuts, and on the nectar of flowering trees, including* Erythrina, Bombax, Butea, Careya *and* Spathodea. *Pollen collects on its crest, and the myna is considered to be an important pollinator of these trees. Indeed, the frequency with which the crests of* Acridotheres *mynas become covered with pollen when they are feeding on nectar suggests that mutual adaptations between the birds and the trees may have occurred. Other nectar feeders among this genus include the Common Myna* (A. tristis), *which visits a similar range of flowering trees to the Jungle Myna. The Bank Myna* (A. ginginianus) *occasionally visits flowering* Erythrina *trees, while the Black-winged Myna* (A. melanopterus) *of Java and Bali may be predominantly a fruit and nectar feeder, spending much of its time in trees, although it also forages for insects on grassland and beaches.*

[*Acridotheres fuscus fuscus*, Kaziranga National Park, India. Photo: Bernard Van Elegem]



*The **Greater Blue-eared Starling** collects most of its food on the ground, where it hops, rather than walking or running like many terrestrial sturnids. Feeding mainly on fruit and insects, including locusts and other grasshoppers, beetles termites and ants, while captive birds also killed and ate frogs, lizards and baby mice. It hawks for flying insects, sometimes using large mammals as a perch, and forages in trees for fruit such as figs* (Ficus), *and nectar. It also feeds on the nectar of sisal* (Agave sisalana). *Greater Blue-eared Starlings have been observed taking ripe cereal grains, and also scavenging food discarded by people.*

[*Lamprotornis chalybaeus sycobius*,
Kruger National Park,
South Africa.
Photo: Rolf Kunz]

parasites, all of which are aggravated when the same nest-site is used repeatedly. Studies in the artificial environment of nestboxes provide some insight into these stresses, and it appears that, at least for the Common Starling, nestling survival rates are higher in more spacious nestboxes.

Eggs of exclusively hole-nesting species, such as barbets, and also of those building closed nests, such as waxbills, are pure white. The distinctively coloured eggs of many starlings have been cited as evidence that this family originated from birds which had open cup-nests, and that hole-nesting would therefore be a secondary adaptation and not the primitive condition for the family. Coloured eggs, especially with differences in coloration and pattern among individual females, have also been regarded as an adaptive response to brood parasitism by cuckoos (Cuculidae). The phenomenon of egg-matching, however, is demonstrated exclusively by those cuckoo species the young of which ejects the nest contents, so that the host invariably loses its entire clutch. Starlings appear to be parasitized chiefly by the Great Spotted Cuckoo (*Clamator glandarius*), which does not eject host eggs and young nor produce mimetic eggs. To date, parasitism by this cuckoo on starlings has been recorded only in Africa, where the Cape Glossy, Splendid Glossy and Rüppell's Glossy Starlings, Burchell's Starling (*Lamprotornis australis*), the Greater Blue-eared Starling, Meves's Long-tailed Starling, the African Pied Starling, Hildebrandt's Starling (*Lamprotornis hildebrandti*), the White-crowned, Red-winged and Pale-winged Starlings, and the introduced Common Myna have been documented as hosts. There are also a few West African records of parasitization by Levaillant's Cuckoo (*Clamator levaillantii*) on the Chestnut-bellied Starling; the eggs of the two species matched in background colour, but not in markings. In addition, some hole-nesting African starlings are victimized by other brood parasites: thus, the Cape Glossy and Greater Blue-eared Glossy Starlings are parasitized by the Greater Honeyguide (*Indicator indicator*) and the Amethyst Starling by the Lesser Honeyguide (*Indicator minor*), while the African Pied Starling is parasitized by both of those species. Although honeyguide chicks destroy their nestmates, the eggs of honeyguides are pure white; it may not, however, be feasible for the starlings to eject strange eggs from a deep nest-hole without damaging their own eggs in the process. African Pied Starlings are apparently able to usurp nest-sites of European Bee-eaters (*Merops apiaster*) by removing the latter's eggs from the nesting burrow, but they do this only prior to laying their own clutch. Perhaps the behaviour is "switched off" once the starlings have entered the egg-laying phase of the breeding cycle.

An alternative, and not mutually exclusive, explanation for the evolution of diversity in the egg patterns of individual females would be intraspecific brood parasitism. This is well documented for the Common Starling, and has been reported for several other sturnid species, such as the White-cheeked Starling, which will, incidentally, occasionally lay eggs also in the



*Termites are part of the diet of many ground-feeding sturnid species. Throughout Africa, starlings also hawk termite alates, the winged reproductive form which emerges during rainy periods. Although common within most parts of its range, and considered the commonest starling species in Uganda, no detailed information is available about the feeding preferences of **Rüppell's Glossy Starling**. It is described as almost omnivorous, its feeding grounds including camp-sites and picnic areas. A large glossy starling with a long, graduated tail, it forages predominantly on the ground, where it both hops and runs.*

[*Lamprotornis purpuroptera purpuroptera*,
Masai Mara National Park,
Kenya.
Photo: Ferrero-Labat/
Ardea]

nests of the Purple-backed Starling. Starlings in these genera, however, do not lay patterned eggs, although their eggs do, nevertheless, display small variations in colour and shape. Furthermore, Common Starlings are known to be able to remove intact eggs from nests, and this habit is, in fact, a normal part of the nest-cleaning process by males following desertion of a clutch by a female.

Polygyny, whereby one male is simultaneously mated to more than one female, is recorded occasionally among starlings. In contrast to some other bird families, such as the weavers, however, there is no evidence that it is the regular mating system of any member of the Sturnidae. The two *Sturnus* species are opportunistically polygynous, mostly with only two mates, although up to five have been recorded in the field; less than 5% of the breeding males are involved in such behaviour. It is most often reported for the Common Starling, by far the best-studied species in the family. Polygyny by Common Starlings is generally an artefact of the provision of nestboxes, which enables a single male to defend and advertise more than one nest-site within a small area. Disturbance by human observers has also been cited as a contributing factor. In these situations, the male generally provides the primary, first-established female, but not the secondary female, with some assistance in the incubation of the eggs and the feeding of the young. It has been shown experimentally that the provision of additional nestboxes stimulates the male to display more, and thus to devote more attention to courtship than to parental care. A similar effect can be elicited, from starlings and some other species, by supplementary dosages of testosterone, which inhibits transition to the parental-care phase of the breeding cycle while keeping the male in mate-acquisition mode.

Although most starlings are likely to be socially monogamous, this need not imply long-term pair-bonds. Nevertheless, it is likely that, when partners stay together throughout the year, the pair-bond regularly lasts for several successive breeding seasons, and this has been confirmed for the Common Hill Myna, the Common Myna, the Red-winged Starling, the African Pied Starling and the Cape Glossy Starling. Genetic studies carried out as a means of determining the parentage of young birds have routinely revealed that species which appear, from behavioural observations, always to be monogamous may frequently indulge in extra-pair copulations, and this will doubtless prove to be the case for many starlings, too. Two studies involving DNA-fingerprinting of Common Starlings in colonies in Belgium and Sweden showed that, respectively, 9·7% and 8·7% of chicks were unrelated to the male of the pair which was rearing them. In the case of Spotless Starlings, under experimental treatments with hormones, up to 20% of chicks resulted from extra-pair fertilizations; importantly, these experiments showed that the number of chicks resulting from extra-pair fertilization was greater in nests of polygynous males than in nests of monogamous males, indicating a genetic cost of polygyny.



Although it is primarily a fruit eater, the ***Common Hill Myna*** *also includes insects and small vertebrates, such as lizards, as regular parts of its diet. Geckos (Gekkonidae) are taken from tree trunks, especially when the birds have young to feed. Many sturnid species which are fruit eaters for the rest of the year increase the proportion of animal food during the breeding season. Like the* Acridotheres *mynas, the Common Hill Myna frequently feeds on the nectar of flowering trees, its face becoming heavily dusted with pollen. Large numbers of Common Hill Mynas can gather at fruiting trees.*

[*Gracula religiosa andamanensis*, Havelock Island, Andaman Islands. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]



The ***Micronesian Starling*** *regularly takes the eggs of seabirds, as it is about to demonstrate at this nest of a Black Noddy* (Anous minutus). *It may take advantage of some human disturbance at seabird colonies to attack eggs. Otherwise these birds forage in the understorey and canopy of trees, mainly eating fruit and seeds, as well as insects. Only a few members of the family are actully known to puncture and eat the eggs of other birds, but the Common Starling* (Sturnus vulgaris) *and the Common Myna* (Acridotheres tristis) *are considered significant egg predators at seabird colonies on some oceanic islands. In the Azores, Common Starlings are responsible for significant egg losses at a Roseate Tern* (Sterna dougallii) *colony.*

[*Aplonis opaca orii*, Palau Is. Photo: Mandy Etpison]



Observations of starlings feeding on over-ripe and fermenting fruit led to speculation that the birds might become intoxicated from the alcohol content. Laboratory experiments with ***Common Starlings*** *demonstrated, however, that this species has at its disposal enzymes which break down alcohol very rapidly, so that even individuals provided with high concentrations of ethyl alcohol in their diet showed no change in blood alcohol levels. Common Starlings are also able to eat the harmless aril of the yew* (Taxus baccata) *"berry", and defecate the seed, with its highly toxic coating. Yew berries are avoided by seed predators and other bird species which break seeds down in the process of digesting them.*

[*Sturnus vulgaris vulgaris*, Weesp, Netherlands. Photo: Will Leurs/ www.agami.nl]

In one study of the Superb Starling in Kenya, 14% of the offspring were fathered through extra-pair copulations. This is a socially monogamous species, which is also a co-operative breeder, and lives in groups of several potential breeders and helpers. Females can mate with group members or with "outsiders". Mating with several males within the group has the effect of recruiting additional helpers to feed the nestlings, whereas mating with other males offers only the potential genetic benefits of increased out-breeding and thus greater genetic variability in the offspring.

There is an interesting dichotomy between African and Asian starlings with regard to parental care. In the case of the African species for which data are available, either from field studies or from observations in captivity, only the female incubates, while the male sits nearby and sings. The only exception involves the Wattled Starling, which is Asian in origin, yet with all of the Asian starlings observed at the nest it was found that both sexes participate in the care of the eggs. Despite this, male starlings from both lineages help to feed the nestlings, and also feed the young after they have fledged. Both parents routinely remove faecal sacs from



The estimated proportions in the diet of the ***White-necked Myna*** *of Sulawesi are 78% fruit, 21% invertebrates, and less than 1% vertebrates. Found mostly in primary and secondary forest, it occurs more rarely in modified habitats, such as plantations. Studies in Africa and Asia have confirmed that starlings are significant dispersal agents for several native tree species, such as the West African* Boscia senegalensis *and* Sterculia quinqueloba *in Malawi and, in Asia, the Indian banyan* (Ficus benghalensis), *white sandalwood* (Santalum album) *and neem* (Azadirachta indica).

[*Streptocitta albicollis torquata*, Tangkoko-Dua Saudara Nature Reserve, N Sulawesi. Photo: Mark Jones/Roving Tortoise Photos]



Mulberries (Morus) *and other fruits are important to the* ***Rose-coloured Starling*** *in autumn and winter, but during the breeding season its diet is dominated by locusts and other grasshoppers. An individual bird can eat 120–220 locusts (particularly flightless hoppers) per day. Most locusts are taken on the ground, a group of birds hurrying in one direction, with those at the back of the flock flying over those in front, so that the group moves in a "roller-feeding" manner. Rose-coloured Starlings breed in large or very large colonies, on open steppes, where locusts and grasshoppers are abundant. Breeding is closely tied to food availability, and may be abandoned in a lean year for locusts.*

[*Pastor roseus*, Lesvos, Greece. Photo: Mathias Schäf]

the nest. Aggressive defence of the nest-site is a mark of certain pairs of Red-winged Starlings, which will swoop at passers-by and domestic animals, often approaching from behind and physically striking the intruder with their claws. In one intriguing example, a male of this species was caught and ringed at a nest-site on the campus of Rhodes University, in South Africa; the ornithologist, while leaving the building on the same evening, was attacked by the starling. On the following day, the ornithologist, in order to test the situation, walked out in the midst of a crowd of students, but he was immediately singled out for attack again. Clearly, some Red-winged Starlings can recognize individual humans, and one may perhaps be permitted to surmise, anthropomorphically, of course, that they can also bear personal grudges.

Co-operative breeding, or the phenomenon of helpers at the nest, whereby individuals other than the parents assist in the raising of the young, has been reported for many families of African and Asian birds. There are, however, only two known observations suggestive of occasional co-operative breeding by Asian starlings, these involving the Shining Starling and the Yellow-faced Myna. Among African starlings, co-operative breeding has

The ***Bronze-tailed Glossy Starling*** *is known to eat insects and fruits. It forages mostly on the ground, and less often in trees. There are second-hand reports of the birds scavenging at abattoirs. The Wattled Starling* (Creatophora cinerea) *scavenges at similar sites, and the African Pied Starling* (Lamprotornis bicolor) *and the Red-winged Starling* (Onychognathus morio) *have been recorded eating meat on carcasses at abattoirs, and carrion. The Bronze-tailed Glossy Starling is a poorly documented species, not always separable in the field from similar congeners like the Lesser Blue-eared Starling* (L. chloropterus)*, with which it often associates in mixed flocks.*

[*Lamprotornis chalcurus*, Western Division, Gambia. Photo: Dick Forsman]





Flocks of ***White-crowned Starlings*** *gather at fruiting* Salvadora *trees, and feed on cultivated dates* (Phoenix) *in Somalia. Feeding sturnids can cause damage to cultivated fruit, and several starlings and mynas are regarded as pests. However, a review of frugivory in the Oriental Region concluded that starlings of the genera* Aplonis, Acridotheres, Sturnia *and* Sturnus *are probably the most abundant frugivorous vertebrates in many of today's human-dominated landscapes, and thus play a crucial role in pollination and seed dispersal. Some have a less positive role, in that they disperse alien plants. In South Africa, for example, the native Red-winged Starling* (Onychognathus morio) *helps spread the invasive Australian* Acacia cyclops.

[*Lamprotornis albicapillus*, Ethiopia.
Photo: Jürgen Schneider]

been confirmed as regular or frequent for 15 species. All of the sturnids with helpers are resident birds of savanna, and there seems to be a clear association between co-operative breeding and highly seasonal and semi-arid environments. None of these species is sexually dimorphic, and all are mainly insectivorous or omnivorous, rather than primarily frugivorous; many of them breed colonially. On the basis of these criteria, it is likely that at least some other, poorly studied species may have helpers; species such as the Bronze-tailed Glossy Starling (*Lamprotornis chalcurus*), which has a wide distribution in seasonally dry savanna areas, should be investigated more closely. Three of the co-operatively breeding sturnids, namely the Superb Starling, the Chestnut-bellied Starling and the African Pied Starling, have now been studied in some detail in the field. In all cases, there is no involvement of individuals other than the parents during the nest-building and incubation stages, and, while some of the helpers are subadults and juveniles which are feeding younger siblings, unrelated birds do provide some additional assistance. Although there are a few records of group-members feeding the incubating female starling on the nest, this behaviour is apparently infrequent when



In Canada, the introduced population of ***Crested Mynas*** *eats cultivated and wild fruits such as cherry* (Prunus), *mountain ash* (Sorbus), Rubus *berries, and currants* (Ribes). *Fruit makes up 60% of the diet in Canada but in the Crested Myna's native southern China, the proportions are 55% animal food, and 45% vegetable matter. Crested Mynas are usually found in open country, including cultivated land, where they forage by probing the grass for ant and cranefly (Tipulidae) larvae, or by hawking for flying insects. They will also scavenge dead fish, and one was seen to harass a nestling Chinese Pond-heron* (Ardeola bacchus) *until it regurgitated its food.*

[*Acridotheres cristatellus cristatellus*, China.
Photo: Zhao Chao]



*A gregarious species with a typical sturnid diet of fruit, nectar and insects, the **White-headed Starling** forages in trees and shrubs. It sometimes joins mixed flocks of foraging insectivores which include drongos (Dicruridae), and cuckoo-shrikes and minivets (Campephagidae). Starlings are not often recorded in mixed-species flocks of insectivorous birds, although a few species do so on a relatively regular basis.*

[*Sturnia erythropygia andamanensis*, Andaman Islands. Photo: Konrad Wothe]

compared with similar behaviour by other co-operative breeders such as the babblers (Timaliidae) and the bee-eaters (Meropidae).

The conflicts and benefits to individual birds in co-operative breeding systems are of great interest, and new genetic and physiological techniques now enable studies to be undertaken on these aspects. For the Superb Starling in Kenya, Rubenstein showed that females may use extra-pair copulations with flock-members as a means of recruiting additional helpers, as described in the preceding paragraphs. More surprising is the finding that the sex ratio of nestlings varies in different seasons according to maternal body condition: in good years more female offspring are produced, and in poor years more males are produced. Where dominance plays a major role in determining breeding status, heavy females are more likely to become future breeders. There is a complex interaction among environment, hormone levels and social behaviour; in bad years, poor food supplies reduce body condition, and while high hormone levels can ensure high rank and thus access to food, elevated levels of steroid hormones also have a negative impact on the physical condition of the bird, and the time spent in social competition reduces foraging time. It has



*The highly opportunistic and almost omnivorous **Red-winged Starling** takes nectar from a wide range of plant species. Stone "anvils" are used to break up hard-shelled prey such as millipedes and sun-spiders (or solifugids). Red-winged Starlings exploit human modification of the environment in many ways, for example hawking insects by artificial light after dark. Perhaps applying the techniques used to glean ectoparasites from large animals, they visit car parks to glean insects from radiator grilles. At the University of Cape Town, South Africa, resident pairs enter buildings and traverse corridors to collect food from unattended plates.*

[*Onychognathus morio morio*, Cape Point, Western Cape, South Africa. Photo: Andy & Gill Swash/ WorldWildlifeImages.com]



All members of the family drink by sipping, raising the head to swallow. The ***Common Starling*** *also visits water margins for prey which can include small frogs and toads. Like its congener, the Spotless Starling* (Sturnus unicolor), *it is highly adapted for open-bill probing to extract invertebrates from the sub-surface of grassland. In both* Sturnus *species, and in the White-cheeked Starling* (Poliopsar cineraceus), *which is also highly adapted for open-bill probing, the protractor muscles are very strongly developed, the skull is greatly narrowed, and the eye can be moved forwards to peer down along the line of the bill.*

[*Sturnus vulgaris*, Alicante, Spain. Photo: Markus Varesvuo]

been suggested that social interactions in such societies drive the relative costs of being dominant, or breeding, and of being subordinate, or non-breeding, and that behaviour is the main influence on stress hormone levels. With the Superb Starling, however, it appears that environmental conditions influence the costs of dominance and of subordination, which in turn affect the intensity of social interactions between the birds, and ultimately determine their roles in the breeding system. In the Kenya study, the number and proportion of first-time breeders was higher in seasons following wetter years than in those following dry years. Variable environments are thus responsible for many of the variations in the breeding patterns and success of some bird species.

Movements

Bird-ringing as a technique for studying migratory movements, using unique identification numbers for individual birds, began in 1899 when a Danish schoolmaster, Hans Christian Mortensen, started to ring Common Starlings in his village in an attempt to discover their whereabouts in the winter. The northern populations of the Common Starling are, indeed, migratory, with north–south movements typical of populations breeding in the eastern part of the species' range, these spending the non-breeding season in western China and northern India, Pakistan, Afghanistan and the Middle East. In western Europe, the direction



The habitat of the ***Greater Blue-eared Starling*** *is dry savanna woodland, which in West Africa extends into desert zone. But like other sturnid species, it needs access to standing water for drinking and bathing, and the West African birds apparently move south in the dry season. Availability of water may limit distribution. For example, the Madagascan Starling* (Hartlaubius auratus) *is found throughout the coastal areas of Madagascar, except in the arid south-west corner. The movements of other sturnids of arid areas, such as the Magpie Starling* (Speculipastor bicolor), *may also be related to seasonal availability of water.*

[*Lamprotornis chalybaeus cyaniventris*, Ethiopia. Photo: I. R. Beames/Ardea]



Common Mynas (Acridotheres tristis) *have been recorded drinking hot seawater from pools in the upper tidal zone in the tropics. But the* ***Yellow-faced Myna****, found in wet forest habitats of different kinds, including rainforest and swamp-forest, has easy access to fresh water. It is primarily a frugivore. Despite its large size, the Yellow-faced Myna also hawks insects from high branches. Usually seen in pairs, it is also found in small groups, and occasionally in larger mixed-species flocks of frugivores. It is often found feeding in the company of another of the mynas of the New Guinea region, the Golden Myna* (Mino anais).

[*Mino dumontii*, near Brown River, SE New Guinea. Photo: Brian J. Coates]

of migration is to the south-west or even the west of the breeding areas, Scandinavian breeders typically moving west-south-west for the winter. The wintering areas of these birds embrace the western seaboard of Europe southwards to the Iberian Peninsula and to African countries north of the Sahara, individuals sometimes reaching the Atlantic islands of the Canaries, Madeira and the Azores. Juveniles from Switzerland initially move north-west to the North Sea and Atlantic seaboard prior to their autumn migration southwards.

The introduced Common Starling population in North America is also migratory in the northern part of its range. Although there is no recognized regular migration in Australia, long-distance movements of Common Starlings have occasionally been recorded. Moreover, individuals of this species sometimes manage to cross from South Australia into Western Australia, traversing the inhospitable terrain of the Nullarbor Plain.

True migration by birds implies discrete breeding and non-breeding areas which are occupied at different times of the year, the migrants generally following a clearly defined route when moving between the two areas. By these criteria, there are few other starling species which can be categorized as migrants on the basis of current knowledge of their movements. In the Indian Subcontinent, the Spot-winged Starling breeds in the western Himalayas and then migrates eastwards to Assam; it is often as-



During courtship, the song of the male ***Common Starling*** *is often accompanied by a peculiar rotation of the half-open wings around the shoulder joint. The elongated feathers of the throat and upper breast are erected during the display. By the breeding season, the pale tips of the feathers have become abraded, particularly on the breast, exposing a strong purple gloss on the head and throat, and a green gloss on the mantle, rump and breast. Male Common Starlings bring green, often aromatic, leaves to the nest during courtship and before egg-laying, which is thought to be an offering directed at the female. The males exhibit increased olfactory sensitivity during the breeding season.*

[*Sturnus vulgaris vulgaris*, Goor, Netherlands. Photo: H. Bouwmeester/ www.agami.nl]



Most forest starlings are hole-nesters. The ***Coleto*** *of the Philippines is found in lowland forests, and in coconut groves, where it nests in holes in dead trees, or in the rotting trunks of coconut palms. A distinctive grey-and-black sturnid, with bare skin covering most of its head, except for a narrow central line of bristly black feathers, it is apparently monogamous. Most hole-nesting forest starling species make use either of natural cavities, or of holes excavated by birds such as woodpeckers (Picidae) and barbets (Capitonidae). The Narrow-tailed Starling* (Poeoptera lugubris)*, a colonial forest-dweller, is dependent on colonial African barbets in the genus* Gymnobucco *for the provision of nest-sites. Surprisingly, several observers have reported that the barbets and starlings may be present at the nesting trees at the same time, and apparently share the facilities quite amicably. The Common Hill Myna* (Gracula religiosa) *may also nest in association with other species, such as the Vernal Hanging-parrot* (Loriculus vernalis)*. Its nest-holes tend to be at least ten metres above the ground. Common Hill Myna nest-holes may be reused in subsequent years. But confined nest-holes pose problems of space, and pollution from droppings and waste material from food, as well as ectoparasites, and all of these are aggravated when the same nest-site is used repeatedly. Studies in the artificial environment of nestboxes suggest that, at least for the Common Starling* (Sturnus vulgaris)*, nestling survival rates are higher in more spacious cavities.*

[*Sarcops calvus melanonotus*, NW Panay Peninsula, Panay, Philippines. Photo: Tim Laman/ naturepl.com]



Closely associated with human-modified habitats, some ***Bank Mynas*** *make use of sites such as brick kilns, bridges and similar structures for their nest-holes. Otherwise, they generally excavate their own nest tunnels in banks of rivers. The tunnels are up to a metre long and end in a broader chamber, which is lined with straw, feathers, pieces of sloughed snakeskin, polythene and other material. In captivity, birds added fresh green leaves regularly. Other urban-adapted species, such as the Common Myna* (Acridotheres tristis)*, nest in lampposts, air-conditioning vents, and abandoned vehicles and machinery. There is a report of a pair of White-vented Mynas* (A. javanicus) *in Singapore which nested in a bus which was still in use.*

[*Acridotheres ginginianus*, Varanasi, Uttar Pradesh, India. Photo: Bernard Castelein/ naturepl.com]

sociated with the Chestnut-tailed Starling, some populations of which migrate. Although the Rose-coloured Starling is nomadic within its breeding range, which extends from eastern Europe east to Central Asia, this species has a regular migration to the Indian Subcontinent, where it is a non-breeding visitor with a clearly defined wintering range. In the latter region, some populations of the Brahminy Starling are migratory within India. Farther east, from north-east India east to the Philippines, the Sundas and Sulawesi, Asian Glossy Starlings are regarded as local migrants which leave the breeding areas each year. Similarly, the Shining Starlings which breed in Queensland, north-east Australia, are seasonal visitors from New Guinea. In China, the White-cheeked Starling, the White-shouldered Starling and the Purple-backed Starling all migrate from northern breeding grounds to non-breeding areas farther south on the Asian mainland, while the Red-cheeked Starling migrates from central Japan and more northerly islands southwards to wintering areas primarily in the Philippines and Borneo.

In the Afrotropics, the various populations of Amethyst Starlings all appear to carry out migrations between breeding and non-breeding areas, with the picture complicated by the fact that a given region may be occupied successively by different populations of breeding and non-breeding birds. From the base of the Horn of Africa, Amethyst Starlings fly across the Red Sea to the Arabian Peninsula, where they are breeding migrants in south-western Saudi Arabia, Yemen and Oman. On the southern fringe of the central African forests, the Splendid Glossy Starling is apparently a migrant, making seasonal visits to its breeding areas in Angola, Zambia and East Africa; elsewhere, its movements are not so clearly defined. Regular migration seems to be the best explanation for the pattern of seasonal occurrence of two East African species, the Magpie Starling and Hildebrandt's Starling, their movements being apparently related to regional rainfall patterns.

Many other sturnids display less predictable movements, which appear to be linked to the seasonal distribution of food supplies. Frugivorous species may temporarily concentrate in flocks at fruiting trees. For example, large numbers of Black-bellied Glossy Starlings appear at the western limits of the species' range in the coastal belt of South Africa during winters when the tree *Rapanea melanophloeos* produces an abundance of fruits. Red-winged Starlings form large mobile flocks in the non-breeding season, and in one year individuals of this species ringed on Rhodes University campus, in South Africa, were recovered a few weeks later on the coast, 40 km due south, and also at inland sites 100 km to the north and 50 km to the north-west. The largely insectivorous Wattled Starling is truly nomadic in the African savannas, with breeding regionally unpredictable and opportunistic in association with temporarily abundant insect food, such as locusts (Acrididae) at the hopper stage or the noctuid-moth caterpillar known as the "karoo rusper" (*Loxostege frustalis*). In recent years, its wanderings have taken flocks to Madagascar and Aldabra, and stragglers have appeared even in the Seychelles, about 1500 km from the East African coast, but the Wattled Starling which landed on a fishing vessel 100 km west of South Africa would not have reached South America unassisted.

A similarly nomadic lifestyle likewise dependent on the patchy occurrence of superabundant insects, primarily locusts, is pursued by the Rose-coloured Starling in Central Asia. This species makes occasional irruptive movements far to the west of its usual breeding range, and migrants at times also overshoot to the east, with, for example, several records in Thailand. More recently, there have been three records of Rose-coloured Starlings in sub-Saharan Africa.

Relationship with Man

The earliest interactions between humans and starlings were undoubtedly those of predator and prey. Archaeological work on Pacific islands has revealed that the first Polynesian settlers had a dramatic impact on island faunas, and precipitated many extinctions. Starlings are well represented in the bones retrieved from these sites, and even today Asian Glossy Starlings and Micronesian Starlings (*Aplonis opaca*) are captured and eaten regularly by some islanders. In northern India, similarly, adult Common Hill Mynas are still trapped for food. The commonest local starling species no doubt formed an item in the diet of numerous people throughout Asia and Africa. In Europe, too, sturnids have been exploited as food. In the Netherlands, Com-



*Alone among forest starlings, the **Grosbeak Starling** is able to use its massive bill to excavate its own nest-holes in rotten trees in the manner of a woodpecker. Also like woodpeckers, Grosbeak Starlings have jaw muscles greatly enlarged to protect the brain from concussion. A highly gregarious species, the Grosbeak Starling lives in flocks of up to 150 individuals. Collectively, colonially nesting Grosbeak Starlings can weaken dead trees to the point where they collapse. The nest has an entrance about 30–40 mm in diameter, with a cavity extending downwards at an angle for up to 30 cm into the trunk. Both males and females line the cavity with grass and leaves. Captive pairs used green leaves in courtship and nest-building. Two eggs are laid, but wild pairs apparently produce only one young per nest. Nest-holes are apparently used throughout the year for roosting. Grosbeak Starlings are generally found at forest edge and in lightly wooded areas. Common in modified habitats, and most frequently encountered in plantations, they are relatively uncommon in primary forest, and evidently absent from secondary forest.*

[*Scissirostrum dubium*, Lore Lindu National Park, Sulawesi.
Photo: Pete Morris]

mon Starlings were encouraged to nest in clay pots and the young were harvested, a practice that extended from the fourteenth century up to as recently as the nineteenth century. Common Starlings are still captured for food in parts of southern Europe, and tinned starling pâté, *pâté de sansonnet*, was widely available in southern France in the late 1980s.

Markets in Africa still include large sections devoted to traditional health remedies, and to materials used in preparations purported to have magical properties. Dead animals and animal parts are an important element at these stalls, and surveys have highlighted the presence of many endangered species among the animals offered for sale. Starlings, however, are generally not a significant component. Of 7000 birds identified at a market in Benin, only 31 were starlings; the sturnids involved were Neumann's Starling, the Chestnut-winged Starling, the Purple Glossy Starling (*Lamprotornis purpureus*) and the Splendid Glossy Starling, all relatively common species in this region. Economic factors, however, seem to play an important role, with greater reliance on traditional medicines when pharmaceutical products become more expensive, whereas the vendors report reduced demand if cheaper generic medicines are readily available.

Urban roosts of Common Starlings in the British Isles were first recorded in the 1840s, but initially the birds always roosted in trees. Once the trees lost their leaves, the birds began to move on to buildings. The starlings achieved national notoriety on 12th August 1949, when a pre-roost assembly perched on the hands of London's famous clock, "Big Ben", in such numbers that their combined weight stopped the clock. This led to questions being asked in parliament, and even calls for the extermination of the Common Starling. Perhaps the greatest accolade for this species following these events was, however, the devotion of an entire episode of the cult 1950s radio programme, *The Goon Show*, to London's starlings and how to get rid of them. Roosts in cities have caused concern in view of the quantity of droppings deposited by the birds overnight. These faeces are malodorous, are unsightly, and can damage masonry and the paintwork of cars. They also render walkways and roads dangerously slippery, and in some regions serve as foci of infection for the fungus *Histoplasma capsulatum*, which can cause serious pulmonary disease in humans. In Asian cities such as Singapore, Common and White-vented Mynas are a nuisance primarily because of the noise emanating from their roosts; Asian Glossy Starlings and Purple-backed Starlings which share these sites are much quieter birds. Dissuading starlings from using roost-sites which people find inappropriate has, however, proved very difficult.

Birds which inhabit open grassland are naturally attracted to airfields, and in these situations they can be involved in collisions with aircraft. Such events, known as "bird strikes", are monitored at all airports, but starlings, because of their small body size and the current standards of aircraft engine, designed to cope with bird impacts, do not rate as a major problem. Nevertheless, a dense flock of starlings presents a real hazard. For example, in



Sturnid nests may be scattered in individual territories, each occupied by a single pair, or they may be clustered in dense colonies. The Australasian ***Shining Starling*** *is one of the colonial breeders, with four to 400 nests in a colony, often built in a single tree. While starlings are often considered to be typically hole-nesting birds, a number also build free-standing nests, which can be either domed constructions, or open cup-nests. Shining Starlings build domed nests with side entrances, made from twigs, vine tendrils and bark strips, lined with strips of palm frond and fresh green leaves, and suspended 10–30 m above ground from the ends of twigs. Adjoining nests can coalesce to form a single structure. Apparently there may be up to three successive broods at the same colony, but it is not clear if the same individual birds are involved. Although the species is assumed to be monogamous, it is possible that Shining Starlings may be co-operative breeders at times, with three or more adults working on one nest. The clutch is of one to four eggs. Incubation may be performed by the female alone, but the chicks are fed by both sexes, by regurgitation and with food carried in the bill. There is a constant loud twittering at colonies, and returning individuals give a high-pitched twittering call. Primarily resident or nomadic, the Shining Starling is largely a breeding visitor in north-east Australia, spending the non-breeding season in New Guinea. In New Guinea, some colonies are treated as a traditional food source by humans, with certain individual people having the right to harvest nestlings. In Australia, likewise, the young were formerly collected for food by Aboriginals. But this species features less in the trade in wild birds than do other members of its genus.*

[*Aplonis metallica metallica*, Mission Beach, Queensland, Australia. Photo: Marie Read]



Compared to forest-dwelling starlings, Asian starlings and mynas of more open country use a much wider range of natural and artificial nest-holes. Breeding colonies of ***Rose-coloured Starlings*** *often consist of hundreds, thousands and occasionally tens of thousands of nests. The season is very short, and the nest is built rapidly, by both sexes. Made from grasses and twigs, it is lined with finer grasses and feathers, and may include aromatic plants. Nests are most frequently placed between stones on scree slopes, but sometimes in cracks in rocks or cliffs, among stones on railway embankments or quarries, or in crevices in buildings. Occasionally the holes of Collared Sand Martins* (Riparia riparia) *are used, and even holes in trees.*

[*Pastor roseus*, Mt Ararat, Turkey. Photo: Hanne & Jens Eriksen]

October 1960, at Boston, in the north-east United States, 62 people were killed when a Lockheed Electra aeroplane crashed at Logan International Airport after a collision with Common Starlings, and the same species was responsible for the crash of a Lockheed C-130 military transport aircraft at Eindhoven, in the Netherlands, in 1996 which killed 34 people. In February 1999, again in the United States, a Boeing 757 lost an engine after taking in 400 Common Starlings during take-off, and was forced to make an emergency landing at Cincinnati, in Ohio. At some military airfields, falconers have been employed successfully to clear birds from the aircraft flightpath, and at some airports dogs of the border collie breed have been used to chase off birds; in both cases, the use of real potential predators ensures that, in contrast to what is generally the case with most mechanical or auditory scaring devices, the birds do not become habituated and consequently ignore the disturbance. Most "bird-scaring", however, is now undertaken in a somewhat more sophisticated manner, whereby starling distress calls are broadcast at flocks as these appear on the airfield or at nearby roosts, but appropriate management of the grassland, often by maintaining a particular grass height, is arguably the most potent means of making the area permanently less attractive to birds.

In an agricultural context, starlings can be beneficial or damaging. Pliny the Elder described the Rose-coloured Starling as a destroyer of locusts, and the Wattled Starling also has been labelled as a locust bird (see Movements). Both species can form vast flocks, which may have some local impact on the numbers of the insects. Studies on the possible use of biological methods to control insect pests in India suggested that, on balance, the Brahminy Starling, the Asian Pied Myna, the Jungle Myna and the Bank Myna were beneficial in terms of the harmful insects which they consumed, whereas the Common Myna ate seeds as well as insects, thus reducing success both at sowing time and during the harvest. Foresters in Korea were encouraged to put up nestboxes for Purple-backed Starlings, which consumed many insect pests, and in the former Soviet Union nestboxes were put up for Common Starlings, which were considered beneficial to both forestry and agriculture. On the other hand, a critical study of the Common Starling in New Zealand, where the species has been introduced, concluded that only with exceptional coincidences of high sheep grazing pressure, high rainfall and high starling density was any meaningful control achieved of local concentrations of the scarabaeid grass grub beetle (*Costelytra zealandica*). Unfortunately, some introductions of the Common Myna on oceanic islands were claimed to be justified on the basis that the birds would control insect pests; this would seem to be at best debatable, and the results of these introductions were usually undesirable. Apart from their "usefulness" in eating harmful insects, starlings could be beneficial to agriculture, and to the wider environment, through their pollination of flowers or their dispersal of seeds of plants of economic or biodiversity importance, but there is currently only anecdotal evidence for their role in these activities.

Damage caused by starlings has received much more attention. Soft fruit, especially grapes (*Vitis*), dates (*Phoenix*), mulberries (*Morus*) and cherries (*Prunus*), are targeted by many species. These include the African Pied Starling, the Wattled Starling, the Pale-winged Starling and the Red-winged Starling in southern Africa; the Greater Blue-eared Starling and the Superb Starling in Tanzania; the Common Starling in Britain, France, Spain, north Africa, New Zealand and the United States; the Spotless Starling in Spain and north Africa; the Bank Myna, the Jungle Myna, the Common Myna and the Rose-coloured Starling in India; the White-cheeked Starling in Japan; and the Samoan Starling (*Aplonis atrifusca*) in Samoa. Cereal crops are damaged by Greater Blue-eared Starlings in Chad, by Superb Starlings in Tanzania, by Bank Mynas and Common Mynas in India, and by Common Starlings in Europe and the United States. The Common Starling has been the focus of major control operations in these last two regions, but, although huge numbers of starlings were killed, there was little evidence of an overall reduction in the population or in the damage that they cause. Currently, the Common Starling is declining in many European countries, but this appears to be related to large-scale agricultural changes, rather than being due to the impact of control measures (see Status and Conservation).

Avian influenza and the associated scaremongering in the early years of the twenty-first century highlighted the possible role of birds as vectors of infectious diseases dangerous to humans. Starlings were not implicated as carriers or victims of the



*This **White-cheeked Starling** has caught food to take back to the nest. Although monogamous, this species is sometimes guilty of both interspecies and intraspecies brood parasitism. It nests in colonies of up to 30 pairs, and the first clutches are highly synchronous. Clutches can consist of two to ten eggs; this varies annually, and declines during the course of the season. Intraspecific brood parasitism was recorded in 18–24% of nests in one study. No eggs are removed when the parasite female adds an egg to the clutch. Late breeders appear to be responsible for most parasitism, behaving as floaters during the early part of the breeding season. Occasionally female White-cheeked Starlings also lay eggs in the nests of Purple-backed Starlings* (Agropsar sturninus). *Intraspecific brood parasitism has also been recorded in Common Starlings* (Sturnus vulgaris). *This may be the explanation for the evolution of diversity in the egg patterns of individual female sturnids. Coloured eggs, especially with differences in coloration and pattern among individual females, have also been regarded as an adaptive response to brood parasitism by cuckoos (Cuculidae). Egg-matching, however, is demonstrated exclusively by cuckoo species whose young eject the nest contents, so that the host invariably loses its entire clutch. Starlings appear to be parasitized chiefly by the Great Spotted Cuckoo* (Clamator glandarius), *which does not eject host eggs and young, nor produce mimetic eggs. The eggs of hole-nesting species are usually pure white, and the distinctively coloured eggs of many starlings have been cited as evidence that this family originated from birds which had open cup-nests, and that hole-nesting is a secondary adaptation and not the primitive condition for the family.*

[*Poliopsar cineraceus*, Beijing, China. Photo: Yilun Qiao]



*Co-operative breeding has been confirmed as regular or frequent for 15 African starling species, including the **African Pied Starling**. Up to five helpers, primarily subadult and unpaired individuals, have been recorded at the nests of this species, which are usually in tunnels up to 1·8 m deep, excavated by the birds themselves in riverbanks or similar sites. All the sturnids with helpers are resident birds of savanna, and there seems to be a clear association between co-operative breeding and highly seasonal and semi-arid environments. None of these species is sexually dimorphic, and many of them breed colonially.*

[*Lamprotornis bicolor*, Nieuwoudtville, Namaqualand, Northern Cape, South Africa. Photo: Peter Steyn/Ardea]

H5N1 strains of avian influenza, but experimental tests in West Africa showed that ground-feeding birds such as the Long-tailed Glossy Starling could potentially serve as intermediate hosts of the tick-borne Crimean–Congo haemorrhagic fever virus. Under natural conditions, however, wild and domestic mammals remain the primary reservoir hosts for this disease.

Humans have affected starling populations most directly through deliberate and accidental introductions. Four species, the Common Starling, the Common Myna, the Crested Myna and the Common Hill Myna, have been introduced, and have become well established, in regions beyond the natural range of the family. Of these four, the Crested Myna has been the least successful. This species continued to occupy a small area around the point of introduction in British Columbia, in south-west Canada, until the early years of the twenty-first century, when it was reported as extirpated in North America, whereas a population first reported in Argentina in 1982 appears to be expanding. This may be related to the temperature tolerance range of this essentially tropical species. The Common Hill Myna has established small populations, probably originating from escaped cagebirds, in the southern US state of Florida, in Puerto Rico and in the Hawaiian Islands. Both Common Starlings and Common Mynas have been



*Although both sexes of the **White-cheeked Starling** incubate the eggs, the female does most of the work. Incubation lasts 12–13 days. The chicks are fed by both parents, and the nestling period is 21–22 days. The White-cheeked Starling is an Asian species, and there is an interesting dichotomy between African and Asian starlings with regard to incubation and care of the eggs. In the African species for which data are available, only the female incubates. The only exception is the Wattled Starling* (Creatophora cinerea), *which is recognized as a species of Asian origin. Male starlings of both African and Asian lineages help feed the nestlings and the young after fledging.*

[*Poliopsar cineraceus*, Kahoku-cho, Yamagata-ken, Japan. Photo: Hirozo Maki]



The addition of mud to the nest structure, as opposed to the building of a nest entirely from mud, is an unusual technique among birds generally, and among the starlings it is restricted to some members of the genus Onychognathus, *which build cup-nests on rocky ledges. The* ***Amethyst Starling*** *of the monotypic genus* Cinnyricinclus, *however, commonly lines its nest with dung; donkey, horse and elephant dung have all been recorded. As in other starlings of the African lineage, incubation is carried out by the female alone, over a period of twelve to 14 days, but the chicks are fed by both parents. There is one record of two males and one female feeding chicks, but no evidence that co-operative breeding is a regular occurrence. Genetic studies to determine the parentage of young birds of other families have routinely revealed that species which appear, from behavioural observations, always to be monogamous, may frequently indulge in extra-pair copulations. This will doubtless prove to be the case for many starlings, too. Two studies involving DNA-fingerprinting of Common Starlings* (Sturnus vulgaris) *in colonies in Belgium and Sweden showed that, respectively, 9·7% and 8·7% of chicks were unrelated to the male of the pair which was rearing them. Studies of Spotless Starlings* (S. unicolor) *showed that the number of chicks resulting from extra-pair fertilization was greater in nests of polygynous males than in nests of monogamous males, indicating a genetic cost of polygyny—or that what is sauce for the gander can also be sauce for the goose.*

[*Cinnyricinclus leucogaster verreauxi*, KwaZulu-Natal, South Africa. Photo: Guy Upfold]



*The nestlings of the **Chestnut-tailed Starling** are fed mainly with insects, particularly caterpillars and beetles. Both males and females incubate the eggs and feed the chicks. There is no information on incubation and nestling periods for this, or for two other members of this genus. However, in the Brahminy Starling* (Sturnia pagodarum), *where the male is reported to feed the female on the nest, incubation lasts 12 days, and the nestling period 18–21 days. Hatching success was 91–95% over four years, and overall nesting success 67%. The species of this genus are highly arboreal, but on non-breeding grounds the White-shouldered Starling* (S. sinensis) *has been seen to forage on the ground among cattle.*

[*Sturnia malabarica*, Assam, India.
Photo: Amano Samarpan]

introduced in South Africa, Australia and New Zealand, and in all three areas Common Starlings appear to be the more widespread and abundant species. Range expansion of both species continues in southern Africa, and Common Mynas have recently colonized Swaziland and Botswana. From an initial release of 99 Common Starlings in New York, there are now, according to some estimates, more than 300 million individuals of this species in the United States and Canada combined, so that the colonization of North America has been an unqualified success for this bird; in this region, it is not confined to the proximity of human settlements. In South Africa, in contrast, the Common Starling is an urban bird, and in rural areas it is found only in the immediate vicinity of buildings. A more recent development, and a worrying one, has been the appearance and subsequent establishment of Common Starlings in Buenos Aires, in Argentina. Continued expansion by this species could take it outside urban habitats and into the vast wet grasslands of the *pampas*, a habitat that looks, at least superficially, to be eminently suitable for it. Here, it could interact both with agriculture and with native bird species.

On a worldwide basis, the Common Starling has been included among the 100 most invasive species, and it has been a "key witness" in several studies in which the reasons why some introduced alien organisms are highly successful in new habitats whereas others fail have been examined. Since, for several starling introductions, the numbers of individuals introduced in the first instance are known, genetic and morphological changes in the species concerned could provide clues as to how quickly populations adapt to new environments. Thus, for both the Common Starling and the Common Myna, data on New Zealand individuals 100 years after their introductions there suggested that the phenomenon of genetic drift in small isolated populations had occurred, resulting in random, non-adaptive changes. In contrast, the rapid spread of the introduced Common Starling in North America and its large population there today have led to very low genetic diversity among widely separated populations. The Common Myna has been introduced in Singapore, Hong Kong, Brunei, Sumatra, the Caucasus, Saudi Arabia, the United Arab Emirates and Iraq, and also on many islands. These are, in the Atlantic Ocean, Ascension, St Helena and, in the Canary Islands, Tenerife; in the Indian Ocean, Madagascar, the Comoros, the Mascarenes, the Seychelles, the Agalega Islands, the Chagos Islands, the Laccadives, the Maldives, and the Andamans and Nicobars; and, in the Pacific Ocean, Taiwan, Hawaii, the Solomons, Vanuatu, New Caledonia, Fiji, American Samoa, Western Samoa, and islands in the Cook, Society, Tuamotu and Marquesas Groups. Whereas most introduced populations are restricted to settlements, those on the oceanic islands are widespread in open or wooded habitats outside natural forests. Other sturnid species which have been introduced at new localities within the natural distribution of the starling family are the Jun-



***Kenrick's Starling** is a restricted-range species of the Tanzania-Malawi mountains Endemic Bird Area. A poorly known species, it may form a superspecies with Stuhlmann's Starling* (Poeoptera stuhlmanni) *and has been considered conspecific with it. There is little information about the breeding biology of either species. Kenrick's Starling has been recorded breeding in January, March to May, June to July and September to November, although the main season appears to be October. The third member of the genus, the Narrow-tailed Starling* (P. lugubris), *is a colonial breeder. Only females at colonies have been seen with bent tails, suggesting incubation is by the female alone.*

[*Poeoptera kenricki*, Arusha National Park, Tanzania.
Photo: Anabel Harries]



Like many others in the genus Aplonis, *the* ***Asian Glossy Starling*** *is sometimes a colonial breeder. As well as using tree-holes, it sometimes builds its rough, cup-shaped nest of roots, grass and leaves in the crowns of palm trees. It may also build among epiphytes in large trees. The White-eyed Starling* (A. brunneicapillus) *of the Solomon Islands also nests among epiphytes on branches in the canopy. Colonies of 10–40 nests are built in isolated trees. The sympatric Brown-winged Starling* (A. grandis) *is a solitary nester, which builds a free-standing bulky mass of twigs, dry leaves, moss and grass, with a side entrance, in the fork of a tree, or a cavity at the end of a broken branch.*

[*Aplonis panayensis strigata*, Singapore. Photo: Ong Kiem Sian]

gle Myna, in Fiji and Samoa; the White-vented Myna, in Sumatra; Singapore and Puerto Rico; and the Crested Myna, in Singapore, the Philippines and Japan.

In addition to the Common Myna, nine species of exotic starling have been recorded in Taiwan, but it is not clear how many of them have self-sustaining breeding populations. The ritual release of captive birds, practised by both Buddhist and Taoist believers as a meritorious activity, may be promoting the spread of alien bird species in Taiwan, although this is a speculative association at present. In a survey conducted in 1996, it was estimated that, of 68,538 "prayer birds" offered for sale, 6% were non-indigenous in Taiwan, the most common species being the Common Myna, the White-vented Myna and the Jungle Myna. Common Hill Mynas and Black-collared Starlings are also commonly sold in pet shops in Taiwan, and even Asian Glossy Starlings have been offered for sale in a few shops.

A major concern with introduced starlings has been the perception that they will outcompete and displace native species. A



As an almost cosmopolitan species, thanks to introductions, the ***Common Starling*** *suffers the attentions of a wide variety of nest predators, from squirrels (Sciuridae), stoats* (Mustela erminea) *and black rats* (Rattus rattus), *to the Little Owl* (Athene noctua), *and, as here, the European Roller* (Coracias garrulus). *Nevertheless, hatching success is high, at more than 70%. Fledging success is more variable, at 29–98% in different studies, with inter-annual variation, and second broods often less successful than first ones. A long-term study in southern England found large annual differences in the percentage of young returning to the colony, suggesting inter-annual differences in survival or emigration. Few second-brood chicks returned.*

[*Sturnus vulgaris vulgaris*, Hungary. Photo: Markus Varesvuo]



*The nestling period in the **Common Starling** is 21 days. In this and the closely related Spotless Starling* (Sturnus unicolor), *both parents feed the chicks and remove faecal sacs, although in both species the female does a larger share of the work. When male Common Starlings are polygynous, one or more females are often left to raise the brood unaided. Polygyny in Common Starlings is generally the result of the provision of nestboxes, which enables a single male to defend and advertise more than one nest-site within a small area. This stimulates the male to devote more attention to display and courtship than to parental care. Conversely, shortage of nest-sites can lead to fighting.*

[*Sturnus vulgaris vulgaris*, near Ringwood, Hampshire, England. Photo: Mike Read]

key factor in the success of these exotic species, however, has always proved to be their ability to associate closely with people, and to tolerate greatly modified habitats and high levels of disturbance, to which they are better suited than the indigenous birds which they have replaced. They generally do not penetrate undisturbed natural habitats. In Singapore, Common Mynas prefer agricultural areas, and they have apparently declined as such areas have been converted to housing, whereas White-vented Mynas evidently prefer greenery in the built-up suburbs. The five exotic sturnids recorded as now breeding in Japan are the Common, Bank, Jungle and Crested Mynas and the Asian Pied Starling; all are closely associated with human habitation. In garden habitats, both Common Starlings and Common Mynas are aggressive birds, often dominating and physically displacing other species in order to gain access to food, water and nesting sites. There are numerous anecdotal accounts in the literature of Common Starlings being seen to drive away woodpeckers and other species, often in suburban gardens.

In North America, where Common Starlings do enter natural habitats, there were reports that this species was displacing native hole-nesting birds from nest-sites, and starlings were implicated in the national decline of such species as the Eastern Bluebird (*Sialia sialis*). A recent review of long-term population data for this bluebird and 26 other hole-nesters in the United States concluded, however, that the arrival of Common Starlings did not have a significantly negative effect on the population density of the native species except, possibly, in the case of the sapsuckers (*Sphyrapicus*), which are relatively small woodpeckers no bigger than the starling itself. Interestingly, a British survey of Great Spotted Woodpecker (*Dendrocopos major*) numbers during the population decline of the Common Starling concluded that high starling numbers had previously reduced the woodpeckers' breeding success, but it was also noted that a continued increase in woodpecker numbers, long after starling interference had ceased to be important, would have to be attributed to other factors.

Introduced Common Mynas have been implicated in the declines of two island endemics. On St Helena, the myna is apparently a predator on the nests of the St Helena Plover (*Charadrius sanctaehelenae*), a Critically Endangered species, although cat predation and habitat change seem to be major factors in the plover's population decline. There is more direct evidence of nest destruction and interference by Common Mynas in the case of the Seychelles Magpie-robin (*Copsychus sechellarum*), and a myna-control programme forms part of the current recovery plan for this Endangered species. Attempts to eradicate mynas have now been made on several islands in the Seychelles, but hitherto none has been entirely successful. Nevertheless, there is now an active campaign to eradicate the Common Myna and other mynas from islands around the world, but all such efforts will require considerable funding, as well as major dedication and persistence with the control operations.

The commitment needed for a determined effort to eradicate introduced starlings is demonstrated by an ongoing programme with Common Starlings in Western Australia. These birds were successfully introduced into south-eastern parts of Australia in the 1800s, but they failed to reach Western Australia, probably because the arid Nullarbor Plain presented an impenetrable barrier. In the 1970s, however, a few hundred individuals were recorded in the south of the state. By this time, the potential adverse environmental and economic effects of Common Starlings were being recognized both in Australia and in other parts of the world, both in their natural range and in regions where they had been introduced. The Western Australian government wished, therefore, to avoid such problems and established a control programme, which successfully eradicated these early incursions; moreover, it maintained surveillance and, where necessary, control for the following 30 years. In the earliest years of the twenty-first century, however, a new incursion was discovered to be larger than had at first been perceived, and eradication attempts appeared not to be producing the required results. Using population data and damage estimates from other parts of the world, an economic study suggested that, if eradication failed and the starlings spread to the more fertile and agriculturally productive west of the state, the cost of damage that could follow over the long term warranted substantial immediate expenditure to undertake research on the Common Starling's biology in its southern habitats and on improved control measures, along with continuation of existing practices of shooting birds at their nests and trapping them wherever and whenever possible. A total of more than two million Australian dollars has been devoted to this eradication attempt, involving more than 20 permanent and temporary staff and employing specialist advisers from abroad, in order to continue the effort and to improve the control methods. Demographically, this project is a fascinating one. In 2006, the immigrant starling popu-



*During the nestling period of 22–27 days, young **Common Mynas** are fed by both parents, which continue to feed them for several weeks after they leave the nest. Hatching of the 4–5 eggs is often asynchronous, and brood reduction may occur. Hatching success in India is 90%, and in Thailand 73%. Fledging success for natural populations in Asia is 54–76% of eggs laid, with first broods more successful (75%) than second broods (60%), or third broods (under 40%). Solitary nesters, Common Mynas pair for successive seasons, and perhaps for life. Long-term pair-bonds have also been confirmed for the Common Hill Myna* (Gracula religiosa), *and three African species.*

[*Acridotheres tristis tristis*, India. Photo: Gertrud & Helmut Denzau]



Chicks of the co-operatively-breeding ***Superb Starling*** *are fed by both parents and by helpers for 4–7 weeks after leaving the nest. The majority of helpers are male offspring from previous broods. Despite this assistance, breeding success is low. Over four years in Kenya, 75% of nests failed, 90% of the losses being due to predation. In another study in Kenya, 14% of offspring were fathered through extra-pair copulations. Extra-pair mating within the "home" flock has the effect of recruiting additional helpers to feed the nestlings.*

[*Lamprotornis superbus*, Kenya. Photo: Kim Taylor/ naturepl.com]

lation was estimated to be around 2000 individuals, but these were distributed over about 1000 km²; in practice, what is being attempted is the eradication of a rare bird. The Western Australian Department of Agriculture is aware of the problems which this presents, but at this point it is prepared to invest sufficient commitment and funding to maximize the possibility of achieving success.

Greek and Roman literature indicates that Common Starlings were kept as cagebirds more than 2000 years ago, because of their ability to imitate human speech. Laboratory studies have confirmed that this species can imitate both spoken phrases and whistles used regularly by its caretakers, and that these sounds are easily recognized by other listeners. Common Starlings, however, tend to modify such acquired sounds to introduce "off-key" elements. The composer Mozart had a pet starling, and he wrote down a phrase which the bird whistled regularly; some other musical fragments among his music compositions seem to bear the characteristics of Common Starling song. Rather surprisingly, Common Starlings have even attracted the attention of some current popular musicians. In 1972, the guitarist and singer Eric



The ***Red-billed Starling*** *is thought to be resident or a partial migrant in most of its range. It is a non-breeding visitor to Vietnam and Hong Kong between November and March, the birds involved probably migrants from the north of the breeding range. Formerly a vagrant in Japan, it is now an annual visitor, and it also seems to have become fairly regular, if scarce, in Taiwan, where this photo was taken. Perched beneath the two males and above the two females is another winter visitor to the island, a* ***White-shouldered Starling****.*

[*Poliopsar sericeus* and *Sturnia sinensis*, Matsu, Taiwan. Photo: Pete Morris]





Island endemics are always at particular risk, and the five species of starling known to have become extinct in the past three centuries were all found on oceanic islands. Although not globally threatened, and in fact widely distributed and common on many of the islands in its range, the ***Polynesian Starling*** *is nevertheless a restricted-range species. Its twelve recognized subspecies are distributed among the Vanuatu, Temotu, Fiji and Samoan Islands Endemic Bird Areas, and the Rotuma, Wallis and Futuna, Niuafo'ou, Tonga and Niue Secondary Areas. Another restricted-range species, the* ***Socotra Starling****, is found on Socotra, an island EBA in the Indian Ocean. Its population was estimated at 12,000 individuals in 2003. The Socotra Starling was formerly rated as Vulnerable, but it is now regarded as not globally threatened. However, the situation of island endemics can change with catastrophic speed. Now Critically Endangered, the Pohnpei Starling* (Aplonis pelzelni)*, found only on the island of Pohnpei in the Caroline Islands, appeared to be reasonably common in 1930. But the species was not found at all during a survey in 1983, and it was thought to be extinct, until a specimen was obtained in 1995. Habitat loss, hunting and predation by rats may account for its decline. Another Caroline Island endemic, the Kosrae Starling* (A. corvina)*, was extinct by 1931. Ironically, given that habitat destruction is often the main driver of the extinction of forest-dwelling species, the forests of Kosrae were, and still are, largely intact. The extinction of Kosrae's two endemic birds was probably due to predation by rats.*

[Above: *Aplonis tabuensis vitiensis*,
Namena Island,
Fiji Islands.
Photo: Clifford & Dawn Frith.

Below: *Onychognathus frater*,
Socotra.
Photo: Peter Ryan]



*A distinctive myna with a wispy crest, white lower back, long graduated tail and a large patch of bare yellow skin around the eye, the **Apo Myna** is a restricted-range species, endemic to Mindanao, in the Philippines. Although very localized, it is common within suitable habitat, above 1250 m in forest and forest edge. Because such sites are rugged and inaccessible, they are considered to be secure, although some logging and clearance has taken place at lower elevations. The bird has been recorded in cut-over areas, but studies are needed into its tolerance of secondary habitats, and its response to fragmentation. As its range is so small and fragmented, any increase in the rate of human intrusion could have a significant negative effect, and the Apo Myna is considered Near-threatened.*

[*Basilornis mirandus*, Mount Kitanglad National Park, Mindanao, Philippines. Photo: Jon Hornbuckle]

Clapton mentioned "tired starlings" in his song *White Room*, while in 1978 the pop group Dire Straits, in the song *Lions*, refers to the flying antics of starlings at their roosts, seemingly a reference to the Common Starlings which at that time roosted nightly in central London.

Coletos in the Philippines are kept as pets because they are said to mimic human speech, and Common and Crested Mynas can also be taught to utter a few phrases, but the best "talkers" are reputed to be the hill mynas. In India, young Common Hill Mynas are taken both from artificial nest-sites and from natural holes in trees, whereas adult Southern Hill Mynas are captured by trappers in southern India. Sri Lanka Hill Mynas are also popular cagebirds, and many of them are taken as young from the nests. Reports from India and Thailand suggest that, in each country, more than 20,000 hill mynas are sold annually as cagebirds on the open market. The robbing of natural nests is now threatening the survival of Common Hill Mynas in Thailand, and, although this species is currently seldom bred in captivity, trials suggest that this could be a practical method of reducing the pressure on the wild populations. Indonesia, too, has a long tradition of bird-keeping, and a survey revealed that 22% of households in five major cities kept pet birds, in many cases wild-caught species, which included starlings. Novel vocal characteristics were sought after, and in 1998 hill mynas which could sing the soccer World Cup theme song fetched three to four times the normal price.

Brahminy Starlings are esteemed songsters in India, and are often kept for this reason. The Bali Myna was regarded as a status symbol for affluent and influential people in Java and Bali, and this was the primary cause of its popularity as a cagebird in the region. The striking plumage of many starlings, coupled with the attraction of exotic birds for affluent bird-fanciers, has led to a great variety of species appearing in the bird trade, and finding their way both to private collections and to zoological gardens and, for some species, thence into the wild.

Although at least 26 different members of the Sturnidae have been bred in aviaries by dedicated aviculturalists and specialist zoos, most captive birds are wild-caught individuals, and high mortality occurs in transit. Records from Delhi airport, in India, for the years 1983–1990 showed that, in every year, more than 3000 "mynas", a designation which could represent nine different starling species, were exported legally. Clearly, these official records from a single export site represent only a very small proportion of the true numbers of starlings traded, and they emphasize that customs officers are generally ill-equipped to identify the species involved.

In addition to the Greek and Roman literature already mentioned, more recent writings have cited Common Starlings, occasionally with unexpected ramifications. For example, Shakespeare's reference to the starling's ability to talk was to result ultimately in the species' introduction in North America. A wealthy American of German descent, Eugene Shieffelin, led one of many acclimatization societies in the United States in the second half of the nineteenth century. It is claimed that Shieffelin intended to introduce all of the birds mentioned by Shakespeare, and he did, indeed, import many, most of which failed to become established. His greatest success, however, was with the Common Starling, which he imported from England and released into Central Park, New York, in 1890. This species is now one of North America's most numerous, and probably most damaging, birds.

Status and Conservation

Island endemics are always especially at risk, and the five species of Sturnidae known to have become extinct in the past three centuries were all found on oceanic islands (see HBW7, pp. 54–55). One of these is the Norfolk Island Starling (*Aplonis fusca*), including the Lord Howe subspecies *hulliana*, the latter sometimes thought to have been a separate species, the "Lord Howe Starling"; both populations were extirpated in the early decades of the twentieth century. The others are the Mysterious Starling (*Aplonis marvornata*), from Mauke, in the southern Cook Islands, the



*There are few recent records of the **Emerald Starling**, which has a limited distribution in savanna woodland in three West African countries. Non-breeding flocks of up to 50 birds have been recorded in Sierra Leone. In 2001, flocks of up to 100 birds were seen at Mt Sangbé National Park, in Ivory Coast, and in 2002 a single bird plus a flock of ten were seen at two sites in the Pic de Fon Forest Reserve, Guinea. Because of the lack of information about its populations, the Emerald Starling is listed as Data-deficient. From 1981 to 1984 large numbers, probably from Guinea, were kept by bird traders in Monrovia, Liberia, and offered at a relatively low price per pair. The birds can be bred in captivity.*

[*Lamprotornis iris.* Photo: Rob Curtis/ The Early Birder]

Kosrae Starling (*Aplonis corvina*), from Kosrae, in the Caroline Islands, the Reunion Starling, from Reunion, in the Mascarene Islands, and the Rodrigues Starling (*Necropsar rodericanus*), from Rodrigues, also in the Mascarene Islands. The last is known only from skeletal material, whereas all of the others, including both subspecies of the Norfolk Island Starling, are represented by museum skins.

On Norfolk Island, the English explorer Captain J. Cook reported no sign of human settlement, but after a British penal colony was established there, in 1788, evidence of earlier Polynesian inhabitants was discovered. The Norfolk Island Starling survived these first settlers, but disappeared after European settlement, presumably under hunting pressure from the new colonists and nest predation by their accompanying animals; it was last recorded around 1923. Lord Howe Island, 1000 km north-east of the south-east Australian city of Sydney, was evidently first visited by humans in 1788, but it was not regularly inhabited until the 1840s. In 1913–1915, "Lord Howe Starlings" were re-



*The majority of the eight globally threatened and nine Near-threatened sturnid species are from islands around southern Asia and the Pacific Ocean. Only two African species feature on the list: the Vulnerable **Abbott's Starling** and the Near-threatened Copper-tailed Glossy Starling* (Hylopsar cupreocauda). *Abbott's Starling is found in a few montane-forest localities in Kenya and northern Tanzania. Little of its highland forest habitat is adequately protected, and recent surveys suggest that it is restricted to forest sections with the least human disturbance. There is some evidence of falling populations at sites where it was formerly categorized as common, such as Mt Kilimanjaro (Tanzania), and the Kikuyu Escarpment (Kenya).*

[*Pholia femoralis*, Mount Meru, Tanzania. Photo: Martin Goodey]



Several Aplonis *starlings have become extinct or exceedingly rare for reasons that are unknown, so careful monitoring is needed. The* ***Rarotonga Starling****, a shy and inconspicuous inhabitant of undisturbed montane forest in the interior of Rarotonga in the Cook Islands, was regarded as abundant in the nineteenth century. In 1973 the population was still put at several thousands, but by 1984 there were estimated to be no more than 100 left. More recently, this figure has been revised to around 500. The disappearance of this species from the lowlands may have been due to competition from the Common Myna* (Acridotheres tristis)*, but this introduced species is thought not to have penetrated the forested uplands.*

[*Aplonis cinerascens*, Rarotonga I. Photo: Pete Morris]

ported as present in thousands, damaging crops, especially fruit, and eating the eggs of other birds. Rats, however, were accidentally introduced from a grounded ship in 1918, and within a few years the starling was apparently extinct.

The Mysterious Starling is, indeed, a mysterious taxon, known only from a single specimen collected in 1825 while it was hopping about in a tree. No further birds were collected from the island of Mauke for almost 150 years, by which time the species had disappeared. Nothing is known of its biology and ecology, nor are there any clues to the reasons for its extinction. The large Kosrae Starling was first discovered in 1827 by the German ornithologist F. H. von Kittlitz, at the time attached to a Russian expedition. It was restricted to the high forests of the interior of Kosrae, and may still have been present in 1880 when F. H. O. Finsch visited the island, since Finsch did not collect in the forests. By 1931, however, it had disappeared, as a museum expedition searched the interior thoroughly but without success. There was still intact forest, but rats were present, and they may have played a role in the disappearance of this species, as well as being responsible for the demise of the Lord Howe taxon.

On Reunion, the local starling was reported as common in 1800, feeding on berries and also, probably, on nectar, as the tongue has a distinctive frayed tip (see Morphological Aspects). Live individuals were captured in 1835, yet in 1837 apparently the last specimen was shot. There are specimens of the Reunion Starling in several museums, including some preserved in alcohol, which have been dissected by anatomists in the twentieth century, and this species was included in a recent molecular phylogeny of the family (see Systematics). The species sported a crest, a trait which is today restricted to some Asian starlings such as those in the genera *Acridotheres* and *Basilornis*.

Known only from skeletal material, the Rodrigues Starling was apparently seen by a French visitor around 1726. The extinct *Aplonis diluvialis* from Huahine, in the Society Islands, was described from bones at an archaeological site dated at 1250–750 years before the present. As a final point of interest, recent studies, using both morphology and DNA data, have revealed that the specimen of a second supposed extinct starling from Rodrigues, named *Necropsar leguati*, is not a starling at all; it is, in fact, an albino trembler (Mimidae) from the West Indies which had been incorrectly labelled.

Of the 112 extant species in the Sturnidae, eight are globally threatened. Of these, two are listed as Critically Endangered. These are the Bali Myna and the Pohnpei Starling (*Aplonis pelzelni*). The decline in numbers of the Bali Myna is well documented. The population numbered 200 individuals in the early 1980s, but it has not risen above 50 since then. This species' original range on Bali has contracted as a result of habitat destruction, with woodland converted to coconut and kapok plantations, and human settlement. The main threat, however, has been the capturing of the starlings for the local cagebird trade. The wild population is currently estimated at 24 individuals, mostly released as part of a recovery programme; globally, more than 1000 are held in captivity. Until the Bali Myna's security within the Bali Barat National Park can be guaranteed, there would seem to be little prospect of re-establishing a wild population of this species. Fortunately, this is considered one of only two starling species which breed readily enough in captivity to supply the cagebird trade in Europe and North America.

The Pohnpei Starling, found only on the island of Pohnpei, in the Caroline Islands, appeared to be reasonably common in 1930. Nevertheless, during a survey undertaken about half a century later, in 1983, the species was not found. This starling was thought to be extinct, until a specimen was obtained in 1995. Habitat loss, hunting by the human population on the island, and possible predation by rats may account for the decline of this sturnid.

Two species, the White-eyed Starling of the Solomon Islands and the Black-winged Myna of Java, Bali and Lombok, are Endangered. The four remaining globally threatened sturnids are listed as Vulnerable: they are the Mountain Starling (*Aplonis santovestris*), confined to one island in Vanuatu, the Rarotonga Starling (*Aplonis cinerascens*), restricted to Rarotonga, in the Cook Islands, the White-faced Starling, found only in Sri Lanka, and Abbott's Starling (*Pholia femoralis*), restricted to a few mountains in East Africa.

A further nine species are currently listed as Near-threatened. These are the Rusty-winged Starling (*Aplonis zelandica*), of the Santa Cruz Islands and Vanuatu; the Tanimbar Starling (*Aplonis crassa*), confined to the Tanimbar Group, in the easternmost Lesser Sundas; the Atoll Starling (*Aplonis feadensis*), found on small islands lying north-west, north and east of the

Bismarck Archipelago; the Yellow-eyed Starling of New Guinea; the Helmeted Myna (*Basilornis galeatus*), found in the Banggai Islands and the Sula Islands, off east Sulawesi; the Bare-eyed Myna (*Streptocitta albertinae*), confined to the Sula Islands alone; the Apo Myna, with a small range on Mindanao, in the south Philippines; the Sri Lanka Hill Myna, locally distributed in the forests of Sri Lanka; and, finally, the Copper-tailed Glossy Starling, confined to the West African rainforest from Sierra Leone east to Ghana. These nine sturnids are generally uncommon and local.

It is notable that the majority of these eight globally threatened and nine Near-threatened species are from islands in the southern Asian region and the Pacific Ocean. Only two African species feature on the list: the Vulnerable Abbott's Starling and the Near-threatened Copper-tailed Glossy Starling.

Unfortunately, the trade in wild birds remains a potential threat to several sturnids, as indicated above, and currently only two members of the family, the Bali Myna and the Superb Starling, reproduce frequently enough in captivity to supply the demand. Ironically, capture for the cagebird trade was a primary cause of the near-extermination of the Bali Myna, and even captive-bred individuals fitted with transponders and released into the wild have been recovered in bird shops. The wild population of the species is currently estimated at just 24 individuals, so that its survival is dependent on the release of birds from captive stocks. A major conservation and recovery programme for the Bali Myna has been in operation since the 1980s. Coordinated by BirdLife International, it has involved the American Association of Zoological Parks and Aquaria, the Jersey Wildlife Preservation Trust and the Indonesian government. The original wild population is now confined to an area of 38 km² in the Bali Barat National Park, in western Bali. There may, however, be some reason for optimism, as a second population has been established on the small island of Nusa Penida, off the south-east coast of Bali. This is derived from 49 released individuals to date and it appears to have adapted to the island's conditions and is breeding. By the year 2008, 16 individuals had been reared on Nusa Penida.

Sturnidae contains some of the world's most endangered species, but in the Common Starling the family also includes one of the world's most numerous birds. The recent history of this species demonstrates, however, that one should not be complacent even about the apparently common members of the family. While the Common Starling's numbers and distribution are increasing in parts of the east and south of its Eurasian range, in western Europe the reverse is the case. The European decline appears to be related to changes in agriculture, whereby reductions in food supply have reduced the survival rate of the species, especially that of individuals in their first calendar-year. In Britain, the population decline of the Common Starling has been of such magnitude that the species, which was once perceived as a serious agricultural, urban and aviation pest, is now placed on the "Red List" of British birds of conservation concern. Furthermore, similar scales of decline have been reported from much of the species' north-west European range, where agricultural intensification has been rampant over the last 30–40 years.

Road traffic as a cause of mortality among wild animal populations has been investigated for relatively few species, and much of the focus has tended to be on mammals as victims. Nevertheless, all animals which cross roads at height below that of a vehicle are at risk, and in one study in India, in which a 5-km stretch of road was monitored for one year, a total of 219 bird casualties was recorded, compared with 42 amphibians, 82 reptiles and 96 mammals. Young mynas were mentioned as being among the more frequent victims. Casual observations elsewhere also suggest that fledglings are particularly at risk from motor vehicles, and a significant number of ring recoveries relate to starlings which have been struck by motor vehicles.

With the formation of permanent human settlements and agricultural activity, large-scale modification of natural habitats began. This was to the detriment of forest-dwelling starlings, although some of the latter have proved resilient. A comparison of the modern fauna of a 4-ha rainforest fragment in the Singapore Botanical Gardens with records from a century ago showed that both the Asian Glossy Starling and the Common Hill Myna were among the survivors, while there were two new starling colonists, the White-vented Myna and the Common Myna. Generally, open-country sturnids and those able to adapt to modified habitats have benefited; some Asian species are essentially commensal with man today. The habit of nesting in structures with religious importance may have led to the acquisition by some species of a new cultural significance, and starlings are among



*Unsustainable exploitation for the cagebird trade has reduced the **Black-winged Myna** to Endangered status. It was formerly common in the plains of east Java, and locally common in central and west Java, but is now rare and very localized throughout. Similar declines have occurred on Bali and Nusa Penida, and there are very few records from Madura or Lombok. A recent survey of 33 historical locations revealed just 32 individuals at three locations. The Black-winged Myna occurs in at least three protected areas, Baluran National Park and Pulau Dua Reserve in Java, and there are a maximum of 24 individuals in Bali Barat National Park, Bali. An introduced population in Singapore is apparently extinct.*

[*Acridotheres melanopterus tertius*, Bali.
Photo: Morten Strange]



*The **Bali Mynas** seen here were among the last wild individuals left before the initiation of the "Bali Starling Recovery Plan" in 1983. This species breeds readily in captivity and good numbers of young have been produced over the years for reintroduction into the Bali Barat National Park, the last remnant of the species natural distribution. However, illegal demand for the cagebird trade has been so high that captive-bred birds have been trapped almost as fast as they are released. In 1999, an armed gang stole almost all the 39 captive birds awaiting release. The wild population fell to just six birds in 2001. A second population has been established on Nusa Penida off south-east Bali, and by 2008 some 49 individuals had produced a total of 16 young. This part of the project is controversial, as the Bali Myna is not native to Nusa Penida. In 2008, the wild population of the Bali Myna was estimated at just 24 individuals.*

[*Leucopsar rothschildi*, Bali. Photo: Ketil Knudsen]

the birds commonly released at Hindu and Buddhist ceremonies (see Relationship with Man). In Africa, Red-winged Starlings which utilize ledges as nest-sites have been nesting on buildings since the nineteenth century, while Tristram's Starling in the Middle East first began to nest on buildings in the 1980s. As a result, both species have now been able to expand their ranges to areas which otherwise lack suitable natural nest-sites.

While man-modified environments may provide new nest-sites in buildings and other constructions, and despite the deliberate provision of nestboxes, nonetheless modification of natural habitats constantly reduces nesting opportunities. In city parks, the regular pruning and removal of rotten branches is detrimental to all secondary hole-nesting animals. Rural human communities which are dependent on fires for cooking and heating preferentially remove dead trees and branches, and it is in these that natural cavities and, in many cases, established nest-holes of barbets and woodpeckers are most likely to occur. Field studies in South Africa have confirmed a reduction in the numbers of breeding birds, including starlings, which are secondary hole-nesters following sustained extraction of fuelwood from particular areas.

General Bibliography

Adams *et al.* (2003), Adjakpa *et al.* (2002), Agoramoorthy & Hsu (2007), Ahmed (1997), Amadon (1943, 1956, 1962a), Anon. (2008b), Archawaranon (2003, 2005b), Baker & Moeed (1979, 1987), Ballerini *et al.* (2008), Beecher (1978, 1985), Beresford *et al.* (2005), Berger (1957), Bishop & Bennett (1990), Bock (1962, 1994), Bockheim & Congdon (2001), Boetticher (1931a, 1940, 1951), Brosset & Érard (1986), Bruns (1984), Cassey *et al.* (2004), Cibois & Cracraft (2004), Clark *et al.* (1990), Clunie (1976a), Cordero *et al.* (2003), Corlett (1998), Craig, A.J.F.K. (1988a, 1996, 1997a, 1999, 2000), Craig, A.J.F.K. & Hartley (1985), Craig, A.J.F.K. & Hulley (2004), de la Cruz-Cardiel *et al.* (1997), Dawson (2006), Dean (2000a), Diamond (2002), Dickinson (2003), Dittami (1987), Draffan (1977b), Dubale & Patel (1975a, 1975b), Durrer & Villiger (1967, 1970), Eguchi & Amano (2004), Ericson & Johansson (2003), Fasina *et al.* (2007), Feare (1984, 1985, 1991, 1994), Feare & Craig (1998), Feare *et al.* (1995), Fry *et al.* (2000), Glyphis *et al.* (1991), Gray (1841), Griffin (2008), Gwinner (1977), Haffer (1993), Hall & Moreau (1970), Hamilton (1959), Hartlaub (1859, 1874), Hausberger *et al.* (1991), Hauser (1988), Haw Chuan Lim *et al.* (2003), Hindmarsh (1984, 1986), Hindwood (1940), Houdelier *et al.* (2009), Hume (2002), Jackson (2007), Jacob (1978), Jepson & Ladle (2005), Johnson & Campbell (1995), Jønsson & Fjeldså (2006), Judson & Bennett (1992), Kang Nee *et al.* (1990), Kark & Sol (2005), Kilpatrick *et al.* (2007), Klatt & Stefanski (1974), Koen (1992), Koenig (2003), Kunkel (1962), Lever (2005), Lin Rueyshing (2001), Long (1981), Lovette & Rubenstein (2007), Lovette *et al.* (2008), Lowe (1938a), Mees (1997), Naik (1970), Neves *et al.* (2006), Nikolaus (2001), Oatley & Skead (1972), Olson (1986), Olson *et al.* (2005), Peach *et al.* (1987), Peacock *et al.* (2007), Peris *et al.* (2005), Pinxten, Honote *et al.* (1993), du Plessis (1995), Polo & Veiga (2006), Prinzinger & Hakimi (1996), Prum & Torres (2003), Reichenow (1914), Renshaw (1939), Ripley & Beehler (1990), Ross (1983), Ross & Baker (1982), Rowley (1969b), Rubenstein (2007a, 2007b, 2007c), Rubenstein & Lovette (2007), Schleussner *et al.* (1985), Schodde & Mason (1999), Sclater (1930), Severinghaus & Li Chi (1999), Sharma (1988), Sharpe (1877, 1890), Shieh Baosen *et al.* (2006), Sibley (1970, 1996), Sibley & Ahlquist (1974, 1984b, 1985a, 1990), Sibley & Monroe (1990, 1993), Simmons (1966, 1986), Skead (1995, 1997), Smith (2005), Sodhi, Lee *et al.* (2005), Sontag & Louette (2007), Spennemann & Allen (2000), Steadman (1989), Summers & Feare (1995), Summers *et al.* (1987), Sweijd & Craig (1991), Thiollay (1984, 1999), Thomson & Ferguson (2007), Traylor (1971), Tréca & Tamba (1997), West & King (1990), West *et al.* (1983), White (1962), Wolters (1980), Yosef & Yosef (1991), Young (1982), Zeller *et al.* (1994), Zuccon, Cibois *et al.* (2006), Zuccon, Pasquet & Ericson (2008).



PLATE 40

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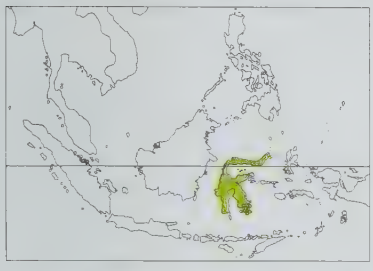
Genus *BASILORNIS* Bonaparte, 1850

1. Sulawesi Crested Myna

Basilornis celebensis

French: Basilorne des Célèbes **German**: Königsatzel **Spanish**: Miná de Célebes
Other common names: Sulawesi/Celebes/King Starling, Short-crested/Celebes (Crested)/Sulawesi Myna

Taxonomy. *Basilornis celebensis* G. R. Gray, 1861, Menado, Makassar, Sulawesi.
May form a superspecies with *B. galeatus* and *B. corythaix*. Monotypic.
Distribution. Sulawesi, including islands of Lembeh, Muna and Buton.



Descriptive notes. 25 cm. Distinctive myna, with feathers of forehead, crown and nape directed to central line to form rigid crest. Forehead to nape and hindneck are glossy violet-blue; white patch on lower ear-coverts, washed with orange posteriorly; upperparts and underparts black, feather tips with green iridescence, feathers at side of breast white with buff wash; tail black, slightly glossy, wings blackish-brown; iris brown-red; bill pale greenish-blue; legs lemon-yellow. Sexes similar, crest slightly longer on male than on female. Juvenile is chocolate-brown with limited iridescence, paler feathers on underparts producing streaked appearance, no orange wash on white areas of plumage. Voice. Calls of several types, described as whistles, squeaks, grunts and warbles; some high-pitched, others prolonged nasal notes.
Habitat. Primary forest and woodland, particularly in hilly areas; reported also from secondary forest, forest edge and clearings. Avoids plantations. Recorded to 1200 m, mostly below 1000 m.
Food and Feeding. Omnivorous; diet includes fruit and animal matter; estimated proportions 44% fruit, 52% invertebrates, 4% small vertebrates. Flocks feed in upper branches with other frugivores, including *Enodes erythrophris*.
Breeding. No published information.
Movements. Apparently resident; presumably moves locally in response to fruiting cycles of trees.
Status and Conservation. Not globally threatened. Restricted-range species: present in Sulawesi EBA. Numerical status uncertain; considered variously as the rarest of the Sulawesi starlings and, conversely, not uncommon. In recent surveys, found to be relatively uncommon in primary forest, very infrequent in secondary forest and modified habitats, and absent from plantations. Occurs in Dumoga-Bone National Park.
Bibliography. van den Berg & Bosman (1986), Blasius (1897), Coates & Bishop (1997), Neumann (1992), Sodhi, Koh *et al.* (2005), Stresemann & Heinrich (1940b), Vorderman (1898a), Walker (2007), Wardill *et al.* (1999), Watling (1983), White & Bruce (1986).

2. Helmeted Myna

Basilornis galeatus

French: Basilorne huppé **German**: Helmatzel **Spanish**: Miná de Yelmo
Other common names: Greater (Crested)/Crested/Sula/(Greater) King Myna, Crested/Greater King Starling

Taxonomy. *Basilornis galeatus* A. B. Meyer, 1894, New Guinea; error = Banggai Islands or Sula Islands.
May form a superspecies with *B. celebensis* and *B. corythaix*. Monotypic.
Distribution. Banggai Is (Peleng and Banggai) and Sula Is (Taliabu, Seho, Mangole), off E Sulawesi.



Descriptive notes. 25 cm. Distinctive myna, with feathers of forehead, crown and nape directed inwards towards mid-line and central feathers elongated to form tall crest. Forehead to nape and hindneck are black with purple sheen; upperparts and underparts black with green iridescence; white patch on lower ear-coverts and side of neck more or less adjoining white patch at side of breast, posterior feathers of neck patch and ventral feathers of breast patch tipped with ochre; wing and tail dark brown; iris brown; bill cream-coloured; legs yellow. Sexes alike. Juvenile has shorter crest than adult, less glossy plumage, with brown chin, dark upper mandible. Voice. Deep booming "poo poo poop" calls the only vocalization reported.
Habitat. Forest, most often in undisturbed areas, also reedswamps, mangroves, and fruiting trees in degraded forest or cultivated areas; to 1000 m.
Food and Feeding. Diet fruit and berries. Usually forages in upper levels of trees, occasionally coming lower. Generally in pairs; flock of 22 individuals once reported.
Breeding. No published information.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Banggai and Sula Islands EBA. Limited data on current status; scarce to moderately common. Has small and fragmented range, and global population likely to be relatively small. Becoming uncommon in Sula lowlands, where loss of the least disturbed forest, its preferred habitat, is a threat. Suitable habitat, particularly in Sula lowlands, should be protected.
Bibliography. Anon. (2008b), Butchart & Stattersfield (2004), Coates & Bishop (1997), David & Gosselin (2002b), Davidson *et al.* (1995), Feare & Craig (1998), Meyer & Wigglesworth (1898), Stattersfield & Capper (2000), White & Bruce (1986).

3. Long-crested Myna

Basilornis corythaix

French: Basilorne de Céram **German**: Molukkenatzel **Spanish**: Miná Moluqueño
Other common names: Ceram Myna/Starling, Seram King Starling

Taxonomy. *Pastor Corythaix* Wagler, 1827, Java; error = Seram, Moluccas.
May form a superspecies with *B. celebensis* and *B. galeatus*. Monotypic.
Distribution. Seram, in S Moluccas.



Descriptive notes. 25 cm; 121–132 g. Distinctive myna, with feathers of crown and nape directed towards mid-line, and elongated to form tall crest of degenerate plumes; tail wedge-shaped. Plumage mostly black, forehead, side of crown, nape, throat and breast with purple iridescence, throat feathers sometimes with fine white tips, mantle, rump and belly with green iridescence; white patch on lower ear-coverts and side of neck and another on side of breast; wing brown, pale buff inner webs on primaries, tail purple-tinged black; iris brown, bare skin around eye dark; bill cream-coloured; legs yellow. Sexes alike. Juvenile undescribed. Voice. Calls include nasal notes interspersed with short piping notes; series of five loud whistles, ascending.
Habitat. Primary forest, also degraded forest; also forest edge, secondary forest, lightly wooded cultivation, and gardens. Lowlands and hills, mostly at 200–900 m.
Food and Feeding. Poorly known. Diet assumed to be fruit, as observed in groups in fruiting trees, and often seen in gardens with *Aplonis mysolensis*. Occurs singly and in pairs.
Breeding. Breeding noted in Jul; presumably monogamous. No other information.
Movements. Resident; any movements presumed very local in nature.
Status and Conservation. Not globally threatened. Restricted-range species: present in Seram EBA. Very poorly known. Appears to be rather local and patchy in distribution. Uncommon in most of range; locally more numerous.
Bibliography. Coates & Bishop (1997), Feare & Craig (1998), Stresemann (1914), White & Bruce (1986).

4. Apo Myna

Basilornis mirandus

French: Basilorne de Mindanao **German**: Prachtatzel **Spanish**: Miná de Mindanao
Other common names: Mount Apo Myna, Mount Apo (King) Starling

Taxonomy. *Goodfellowia miranda* E. J. O. Hartert, 1903, Mindanao, Philippines. Monotypic.
Distribution. Mountains of NC & S Mindanao, in S Philippine Is.



Descriptive notes. 30 cm; 110 g. Distinctive myna, forehead feathers compressed into ridge on mid-line, extending as short degenerate plumes on forecrown and longer ones on crown to form permanent wispy crest; large bare patch around eye, tail long and graduated. Plumage mostly black with glossy blue-black feather tips, lower back white; wing dark chocolate-brown, tail blackish-brown; iris yellow to brown, bare yellow skin around eye extends onto cheek; bill yellowish; legs olive-yellow to blackish. Sexes alike. Juvenile similar, but plumage not glossy and has buffish feather edgings. Voice. Call is series of metallic tinkling notes mixed with snapping and gurgling sounds and with squeaky notes like a rusty gate, resembling call of *Sarcops calvus*.
Habitat. Forest and forest edge, above 1250 m.
Food and Feeding. Diet fruits and insects. Occurs singly, in pairs and in small groups.
Breeding. Two nests found, one each in Feb and Jul; bird with enlarged gonads in Feb. Both nests were in old hole of woodpecker (Picidae); one was c. 15 m above ground and contained nest built from twigs and leaves. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Mindanao and the Eastern Visayas EBA. Common at some sites, e.g. Daggayan and Mt Kitanglad, in N, and Mt Apo, in S; has very small and fragmented range, and known from few localities. At present, habitats mostly secure, as terrain largely rugged and inaccessible. Any increase in rate of human intrusion, however, could have a serious adverse effect on this species.
Bibliography. Anon. (2008b), Butchart & Stattersfield (2004), Collar *et al.* (1999), David & Gosselin (2002b), Dickinson *et al.* (1991), Feare & Craig (1998), Kennedy *et al.* (2000), du Pont (1971), Stattersfield & Capper (2000).

Genus *SARCOPS* Walden, 1877

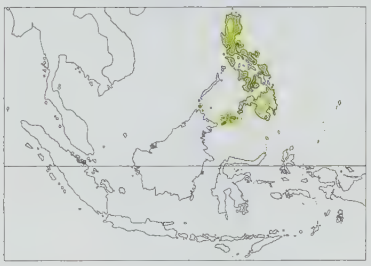
5. Coleto

Sarcops calvus

French: Goulin gris **German**: Kahlkopfatzel **Spanish**: Miná Coleto
Other common names: Bald Starling

On following pages: 6. White-necked Myna (*Streptocitta albicollis*); 7. Bare-eyed Myna (*Streptocitta albertinae*); 8. Yellow-faced Myna (*Mino dumontii*); 9. Long-tailed Myna (*Mino kreffti*); 10. Golden Myna (*Mino anais*); 11. Golden-crested Myna (*Ampeliceps coronatus*); 12. Common Hill Myna (*Gracula religiosa*); 13. Southern Hill Myna (*Gracula indica*); 14. Enggano Hill Myna (*Gracula enganensis*); 15. Nias Hill Myna (*Gracula robusta*); 16. Sri Lanka Hill Myna (*Gracula ptilogenys*); 17. Flame-browed Starling (*Enodes erythrophris*); 18. Grosbeak Starling (*Scissirostrum dubium*).

Taxonomy. *Gracula calva* Linnaeus, 1766, Luzon, Philippines.
Three subspecies recognized.
Subspecies and Distribution.
S. c. calvus (Linnaeus, 1766) – N Philippines (Luzon, Polillo, Catanduanes, Mindoro).
S. c. melanonotus Ogilvie-Grant, 1906 – C & S Philippines (Ticao, Samar, Panay, Negros, Cebu, Bohol, Mindanao).
S. c. lowii Sharpe, 1877 – Sulu Archipelago, in SW Philippines.



Descriptive notes. 27 cm; 120–170 g. Distinctive grey-and black sturnid with bare skin covering most of face from base of bill back to side of nape, ear-coverts and cheek, and to top of head (except for narrow central line of bristly black feathers); tail wedge-shaped. Nominate race has upper nape, lower side of neck, chin and throat matt black, lower nape silver-grey; mantle and back black with silver-grey suffusion, rump black with all feathers broadly tipped silvery grey; wing dark brown with blue-green gloss, tail black with blue-green gloss; underparts black, white pectoral tuft (often concealed), flanks with broad grey feather tips; iris pink or dull red to brown, bare skin on head pinkish (area around eye redder when bird excited); bill black; legs dark brown. Sexes alike. Juvenile resembles adult, with silver ruff less pronounced. Race *melanonotus* is smaller than nominate, with black lower mantle and back lacking grey tips (grey of upper mantle forms contrasting pale collar); *lowii* has paler grey nape, mantle, rump and flanks, and brownish-black wings and ventral plumage. Voice. Typical call a metallic click followed by high-pitched "kliing-kliing"; described also as a "delightful combination" of tinkling, bell-like notes mixed with harsh gurgles and sputtering notes. In flight, wings make whining noise.
Habitat. Forest, forest edge, coconut (*Cocos nucifera*) groves and secondary growth, even isolated trees in clearings; below 1500 m.
Food and Feeding. Diet fruit and insects, also flower nectar; captive pair fed young primarily with insects. Forages singly, in pairs and occasionally in small groups, in fruiting trees.
Breeding. Breeds Mar–Sept on different islands; birds with enlarged gonads in Feb; captive individuals in Europe nested in summer. Apparently monogamous. Nest in hole in dead tree or in rotting trunk of coconut palm; in captivity, pair nested in hollow log. Eggs blue with brown and mauve blotches. In captivity, clutch 2–3 eggs, incubation period 13–14 days, nestling period variously 16 days and 23 days; male of one captive pair did most of the feeding of the young. One ringed individual survived for 5 years in the wild.
Movements. Presumed resident; most ringed individuals recaptured close to ringing site, but one moved 175 km.
Status and Conservation. Not globally threatened. Common in much of range. Formerly hunted for food in some regions. Widely kept as a cagebird, as it is a noted mimic of human speech. Occurs in Quezon National Park, on Luzon.
Bibliography. Amadon (1956), Delacour & Mayr (1946), Dickinson *et al.* (1991), Gonzales & Rees (1988), van't Hart (1978, 1980), Kennedy *et al.* (2000), McClure (1998), McGregor (1907), Peck (1983), du Pont (1971), du Pont & Rabor (1973), Rand (1951a), Rand & Rabor (1960), Rayner (1986), Rens (1978), Ripley & Rabor (1958).

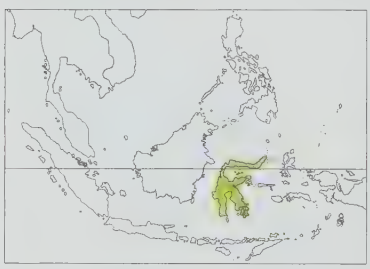
Genus *STREPTOCITTA* Bonaparte, 1850

6. White-necked Myna

Streptocitta albicollis

French: Streptocitte à cou blanc **German**: Weißhalsatzel **Spanish**: Miná Cuelliblanco
Other common names: Buton/Sulawesi/Celebes/Vieillot's Myna/Starling/Magpie

Taxonomy. *Pica albicollis* Vieillot, 1818, New Caledonia; error = Buton or Muna Islands, Sulawesi.
May form a superspecies with *S. albertinae*. Two subspecies recognized.
Subspecies and Distribution.
S. a. torquata (Temminck, 1828) – N & E Sulawesi, including Lembeh and Togian Is.
S. a. albicollis (Vieillot, 1818) – S & SE Sulawesi, Muna and Buton.



Descriptive notes. c. 50 cm, including tail of c. 25–30 cm. Large myna with very long, graduated tail; elongated head feathers of waxy appearance, upward-pointing feathers of lores and nostril region producing effect of short crest on forehead. Nominate race has head black, glossed with purple and blue; mantle and breast pure white, producing broad collar, rest of body plumage black with steel-blue and green iridescence, especially on rump and belly; wing black with purple sheen; tail black with slight gloss, and cross-barring visible from certain angles; iris brown, bare circumorbital skin dark; bill black basally, distal half yellow; legs black. Sexes alike. Juvenile differs from adult in having smaller crest, shorter tail, and less yellow on bill. Race *torquata* is very like nominate, but has longer, all-black bill and shorter wing and tail. Voice. Song, from exposed perch, a clear whistling "towee". Calls reminiscent of those of drongos (*Dicrurus*), with twanging nasal notes and harsh rasping sounds; penetrating "keee" alarm. Loud whirring wing noise in flight.
Habitat. Primary forest and secondary forest of various types; very infrequently in modified habitats and plantations. Sea-level to 1200 m.
Food and Feeding. Diet primarily fruit, also invertebrates, occasionally small vertebrates (lizards); estimated proportions 78% fruit, 21% invertebrates, less than 1% vertebrates. Forages mainly in middle canopy; favours dead isolated trees as perches. Strong flier, readily crossing open areas. Usually in twos or threes, occasionally in small groups of up to five individuals; may join mixed-species flocks.
Breeding. Breeds Sept–Oct. Presumed monogamous. Nest in hole of dead tree. No other information.
Movements. Only local movements reported.
Status and Conservation. Not globally threatened. Very poorly known. Widespread and fairly common to common; relatively common in primary and secondary forest, much less so in other habitats. Occurs in Lore Lindu National Park.
Bibliography. Blasius (1897), Coates & Bishop (1997), Holmes (1979), Meyer & Wigglesworth (1898), Sodhi, Koh *et al.* (2005), Stresemann & Heinrich (1940b), Vorderman (1898a), Walker (2007), Watling (1983), Wennrich (1982), White & Bruce (1986).

7. Bare-eyed Myna

Streptocitta albertinae

French: Streptocitte des Sula **German**: Sulaatzel **Spanish**: Miná Caricalvo
Other common names: Sula/Schlegel's Myna, Sula Magpie, Sula/Bare-eyed/Albertina's Starling

Taxonomy. *Charitornis albertinae* Schlegel, 1865, Sula Islands, Moluccas.
May form a superspecies with *S. albicollis*. Monotypic.
Distribution. Sula Is (Taliabu, Mangole), E of Sulawesi.



Descriptive notes. 45 cm, including tail of c. 25 cm. Large myna with very long, strongly graduated tail; bare, corrugated skin from lores and broad area around eye to chin and upper throat. Has forehead to nape and mantle, and underparts (except lower region) pure white, back, wing and tail black with greenish gloss, some purple iridescence on back; flanks, lower belly and undertail-coverts glossy black with green iridescence; iris light brown, light grey or red, bare facial and throat skin blackish; bill and legs yellow. Sexes alike. Juvenile has forehead mottled with dark brown feathers. Voice. Call resembling sound made by a squeaky gate, in descending series typically of 5 notes, the only vocalization described.
Habitat. Recorded in degraded forest and in open forest and cultivated areas; status in intact forest unclear. Lowlands, below 250 m.
Food and Feeding. Diet thought to be mainly fruit. Seen mostly in middle and upper levels of large trees; sometimes in smaller trees. Occurs mainly in pairs, less often singly or in trios.
Breeding. No information.
Movements. No information.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Banggai and Sula Islands EBA. Very poorly known. Has a very small global range, within which it is local and uncommon. Apparent tolerance of secondary and degraded habitats indicates that it is not at imminent risk.
Bibliography. Anon. (2008b), Butchart & Stattersfield (2004), Coates & Bishop (1997), Davidson *et al.* (1995), Feare & Craig (1998), Meyer & Wigglesworth (1898), Stattersfield & Capper (2000), White & Bruce (1986).

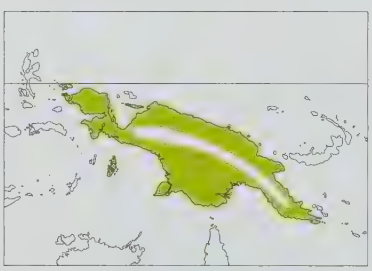
Genus *MINO* Lesson, 1827

8. Yellow-faced Myna

Mino dumontii

French: Mino de Dumont **German**: Papuaatzel **Spanish**: Miná Carigualdo
Other common names: Orange-faced Grackle, Orange-faced/Papuan/Long-tailed(!) Myna

Taxonomy. *Mino Dumontii* Lesson, 1827, Dorey, north-west New Guinea.
Sometimes treated as conspecific with *M. kreffti*; populations of that species from SW Bismarcks appear morphologically closer to present species than to other populations of *M. kreffti*, suggesting that separate species status may require reassessment. Monotypic.
Distribution. West Papuan Is (Waigeo, Batanta, Salawati), New Guinea and many small offshore islands (except those off SE coast), and Aru Is.



Descriptive notes. 25 cm; mean 217 g. Large, short-tailed myna with much of head unfeathered, having large bare patch above, behind, below and, less extensively, in front of eye, as well as bare patch on chin and side of throat; feathers of forehead, central crown, neck and upper mantle, and throat small and lanceolate. Feathers from forehead to central crown, nape and hindneck and upper mantle, also on central throat, black with purple gloss, usually small white flecks on side of neck produced by white filoplumes (sometimes forming more extensive patches); rest of mantle and back black with greenish gloss, rump and uppertail-coverts white; wing and tail black and glossy, white wing patch formed by white area on inner web of outer primary P9, both webs of P4–P8 and outer web of P3; breast and belly black with greenish gloss, lower belly deep golden-yellow, undertail-coverts white; iris orange-yellow, mottled and flecked with black, some regional variation in iris coloration (often brown in S New Guinea, but in N may be dark brown with or without gold spots); bare head skin orange-yellow; bill and legs orange-yellow. Sexes alike. Juvenile has paler facial skin and paler golden lower belly than adult. Voice. Calls loud nasal growling and croaking sounds, sometimes with quality reminiscent of human conversation; in SE of range (Port Moresby) most calls are disyllabic, whereas elsewhere on mainland calls of three or more syllables predominate. Captives mimic human speech and other sounds.
Habitat. Forest of various types, including rainforest, swamp-forest and monsoon forest; also forest edge and partly cleared areas, and will venture into savanna. Generally in lowlands and hills below 800 m, but in E half of New Guinea recorded at up to 1800 m.
Food and Feeding. Diet mainly fruit, also insects. Often feeding on fruit and berries in company of *M. anais* or other frugivores. Gleans caterpillars (Lepidoptera); also hawks insects from high perches. Usually in pairs, also in small groups, occasionally in larger flocks.

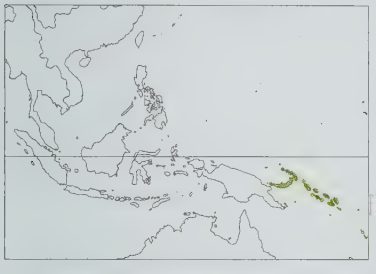
Breeding. Recorded in Aug–Sept and Jan–Apr, suggesting that breeding extends from middle dry season to early wet season. Apparently monogamous, with long-term, possibly lifelong pair-bond. At one nest three birds carried nest material and all three may have fed young, suggesting possible co-operative breeding. Nest of dry sticks, also twigs with green leaves, built in tree hole usually 10–30 m above ground, one nest in base of bird's-nest fern (*Asplenium nidus*) on horizontal branch of dead tree; in captivity, used nextbox lined with straw and strips of paper. Clutch 1–2 eggs, light blue with pale grey and red-brown markings; in captivity, incubation primarily by female, period 14 days, chicks fed by both sexes, nestling period for one brood c. 40 days, only one surviving parent feeding young.
Movements. Resident.
Status and Conservation. Not globally threatened. Widespread and common in New Guinea. Exploited to some degree, as specimens of this species do appear regularly in the pet trade.
Bibliography. Amadon (1956), Beehler *et al.* (1986), Bell (1972b), Coates (1990), Diamond (2002), Draffan (1977b), Eck (2001), Halliday (1984), Hartert (1930), Madarász (1897), McCarthy (2006), Mees (1982), Niznik & Vinett (1997), Ogilvie-Grant (1915), Peckover (1975), Rand & Gilliard (1967).

9. Long-tailed Myna

Mino kreffti

French: Mino de Krefft **German**: Bismarckatzel **Spanish**: Miná de las Bismarck

Taxonomy. *Gracula kreffti* P. L. Sclater, 1869, Solomon Islands.
Sometimes treated as conspecific with *M. dumontii*; shorter-tailed birds from SW Bismarcks (New Britain and Umboi) described as race *giliau*, and smaller birds from E Solomons (Guadalcanal and Malaita) described as *sanfordi*; however, while birds from SW Bismarcks appear to show moderately distinctive morphological traits compared with populations from N Solomons, they are more closely similar to birds from New Guinea currently separated as *M. dumontii*, suggesting that treatment as separate species may not be justified; further study needed at both specific and subspecific levels. Currently treated as monotypic.
Distribution. Bismarck Archipelago and N & C Solomon Is (SE to Guadalcanal and Malaita).



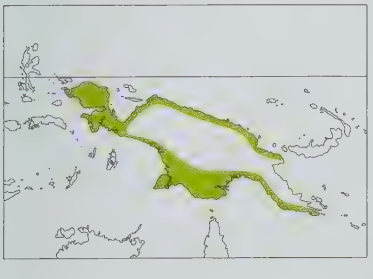
Descriptive notes. 30 cm; 170–215 g. Large myna with large patch of unfeathered skin before, above and below eye and extending to a point behind eye (on nape side. Feathered part of head to hindneck, throat and breast black, glossed purple, usually a few white filoplumes behind bare patch; mantle and back black, glossed greenish-blue, uppertail-coverts white and elongated; tail black, some gloss; wing black with variable gloss, outer primary P9 with white patch on inner web, P4–P8 with white on both webs, P3 with white spot on inner web and primary P2 with white spot on outer web, all forming large white patch (up to 4 cm broad) conspicuous in flight; belly black, glossed greenish-blue, lower belly golden, forming narrow band; undertail-coverts white; iris orange-yellow to orange, bare facial skin orange-yellow to deep orange; bill orange-yellow to deep orange; legs yellow to yellow-orange. Sexes alike. Juvenile has iris yellowish, tinted brown. Voice. Extended whistles and squawks, with loud, high-pitched whistles most like those of *M. anais*. Calls may contain a number of distinctive notes; some regional variations reported.
Habitat. Forest, especially forest edge, also forest remnants, plantations and secondary growth near villages; visits gardens. Generally below 500 m; occasionally to 1100 m in Solomons.
Food and Feeding. Diet fruit; stomach contents included slices of soft fruit, and hard-seeded berries. Occurs singly and in pairs. Forages mostly in canopy; perches for long periods on exposed bare branches of trees.
Breeding. Recorded at nest-holes throughout year. Monogamous; partners remain together throughout year. Nest built in tree hole or in broken palm; clutch of 2 eggs reported, pale blue with grey and red-brown markings. No other information.
Movements. Resident.
Status and Conservation. Not assessed, as often treated as a race of *M. dumontii*. Probably not globally threatened. Common. Described as abundant on Bougainville I, and one of the most obvious and most vocal birds in forest across its range.
Bibliography. Blaber (1990), Bregulla (1992), Cain & Galbraith (1956), Dutson (2008b), Eck (2001), Hadden (1981, 2004), Heinroth (1903), Mayr & Diamond (2001), Sclater (1869), Schodde (1977).

10. Golden Myna

Mino anais

French: Mino d'Anaïs **German**: Orangeatzel **Spanish**: Miná Dorado
Other common names: Golden-breasted Myna; Western Golden Myna (*anais*); Eastern Golden Myna (*orientalis* and *robertsoni*)

Taxonomy. *Sericulus Anaïs* Lesson, 1839, New Guinea. Three subspecies recognized.
Subspecies and Distribution.
M. a. anais (Lesson, 1839) – West Papuan Is (Salawati) and NW New Guinea.
M. a. orientalis (Schlegel, 1871) – coastal N New Guinea E to Huon Peninsula.
M. a. robertsoni D'Albertis, 1877 – S New Guinea E to Milne Bay.



Descriptive notes. 25 cm; mean 152 g. Medium-sized, distinctively patterned myna with patch of bare circumorbital skin extending to form a blue wedge behind eye. Nominate race has head, mantle and upper back black, feathers broadly tipped with glossy oily green, broad collar on hindneck and side of neck creamy orange; feathers of lower back to uppertail-coverts elongated and degraded, with deep orange tips; wing dark brown, white patch on inner webs of outer and innermost primaries (P1 and P9) and on both webs of other primaries, forming conspicuous wingbar in flight; tail black with slight green gloss; chin, throat and belly black with oily-green gloss, breast feathers black with broad orange-yellow tips, lower belly and vent yellow, undertail-coverts creamy white; iris yellow, bare circumorbital skin dark blue; bill and legs yellow. Sexes alike. Juvenile has yellow areas of plumage duller than adult and mottled with black, underparts black with yellow scaling. Races differ in plumage pattern: *orientalis* has forehead and crown glossy-yellow orange, with orange-yellow stripes extending down on each side of hindcrown to join glossy orange-yellow collar; *robertsoni* has entire crown and nape glossy orange. Voice. Song a short whistled series of rising and falling notes, described as reminiscent of sound made by a squeaky bicycle. Alarm call a high-pitched metallic "queelie" or rasping "whaa"; other nasal or squeaky calls reported.
Habitat. Lowland forest below 600 m, including monsoon forest; also forest edge and partially cleared areas, provided that tall trees still present.
Food and Feeding. Diet apparently only fruit. Forages primarily in upper canopy. Occurs typically in pairs, occasionally in small flocks; may join groups of *M. dumontii*.
Breeding. Breeding season believed long, from end of wet season through dry season; activity at nest-holes Feb–Oct, but holes may be used for roosting as well as for nesting. Monogamous; close association of partners and allopreening suggest long-term pair-bond. Nest placed 10–30 m above ground in tree hole, generally at forest edge or in clearing. Clutch size not known, but one nest contained two young; young fed by both adults, perhaps entirely with fruit, and long nestling period likely. No further information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Widespread and fairly common. Possible presence on Yapen, in Geelvink Bay, requires investigation. Apparently readily available in Asian bird trade.
Bibliography. Beehler *et al.* (1986), Bell, H.L. (1984b), Coates (1990), Curzon & Mekke (1993), Hartert *et al.* (1936), Madarász (1899), McCarthy (2006), Ogilvie-Grant (1915), Rand & Gilliard (1967), Rothschild (1921).

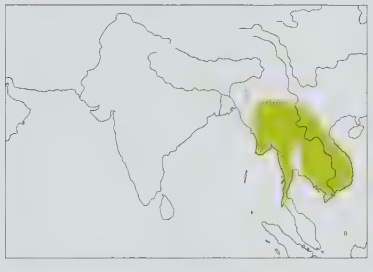
Genus *AMPELICEPS* Blyth, 1842

11. Golden-crested Myna

Ampeliceps coronatus

French: Mainate couronné **German**: Kronenatzel **Spanish**: Miná Coronado

Taxonomy. *A[mpeliceps] coronatus* Blyth, 1842, Tenasserim, south Myanmar.
Monotypic.
Distribution. NE India (Cachar), and from C & S Myanmar E to S China (SW Yunnan), Laos and Vietnam, S to S Thailand and Cambodia.



Descriptive notes. 20 cm; 78–99 g. Medium-sized myna with short square-ended tail, and stiff feathers at base of upper mandible directed forwards over nostrils, bare skin around eye and extending back to form point behind eye. Male has golden-yellow forehead to crown and nape forming crest, and extending anteriorly down to chin and centre of throat; rest of plumage black, glossed with purple on side of face, mantle and chest, glossed blue-green on rump and upper belly; wing black, white patch on inner web of outer six primary feathers, yellow patch on outer web of primaries P4–P9; tail black; iris dark brown, bare skin around eye yellowish-pink; bill yellow, bluish base of lower mandible; legs dull orange. Female is like male but with less gold on head, and with only narrow central strip of golden-yellow on chin and throat. Juvenile is duller and browner than adult, with pale lores, wing patch and throat, faintly streaked below; acquires golden-yellow feathers gradually. Voice. Calls include high, slightly slurred bell-like notes; voice similar to that of *Gracula religiosa* but higher in pitch.
Habitat. Lowland evergreen forest, also deciduous and mixed woodland, open forest, and cleared areas with tall relict trees; in SE Thailand found only in intact primary forest. Lowlands and foothills to c. 800 m.
Food and Feeding. Diet primarily fruit; probably also takes insects. Forages in pairs or in small groups, primarily in canopy.
Breeding. Season Apr–Aug. Monogamous. Nest a rough lining of grass in tree hole 5–15 m above ground. Clutch 3–4 eggs, blue-green with brown blotches concentrated at thicker end; in captivity, incubation by female alone, for 14–15 days, chicks fed by both parents, young fledged after 25–26 days. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Poorly known in the field. Thought to be scarce to locally common in most of range; rare and irregular in peninsular Thailand; rare and very local in NE India. Recorded also in NW Peninsular Malaysia, but status there unclear; no recent records. Quite frequently reported in bird trade in Thailand, although apparently still common in N Thailand. Vulnerable to deforestation.
Bibliography. Ali & Ripley (1972), Chen Fuguan *et al.* (1998), Junge & Kooiman (1951), Lekagul & Round (1991), Meyer de Schauensee (1984), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Smythies (1986), Sontag (1998), Wells (2007).

Genus *GRACULA* Linnaeus, 1758

12. Common Hill Myna

Gracula religiosa

French: Mainate religieux **German**: Beo **Spanish**: Miná Religioso
Other common names: (Eastern) Hill Myna, Talking Myna, Common Grackle

Taxonomy. *Gracula religiosa* Linnaeus, 1758, Asia = Java.

Often treated as conspecific with *G. indica*, *G. enganensis* and *G. robusta*. Birds from Flores (Lesser Sundas), described as race *mertensi*, considered inseparable from *venerata*. Seven subspecies recognized.

Subspecies and Distribution.

G. r. intermedia Blyth, 1845 – N & NE Indian Subcontinent E to Myanmar and S China (including Hainan I), S to N peninsular Thailand, Cambodia and Indochina.

G. r. peninsularis Whistler & Kinnear, 1933 – EC India (Orissa and SE Madhya Pradesh).

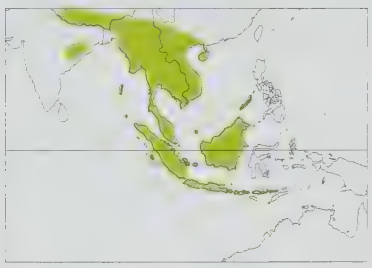
G. r. andamanensis (Beavan, 1867) – Coco Is (S of W Myanmar), Andaman Is and Nicobar Is.

G. r. religiosa Linnaeus, 1758 – S Thailand, Peninsular Malaysia, Sumatra, Bangka I, Belitung, N Natunas, Borneo, Java and Bali.

G. r. batuensis Finsch, 1899 – Batu Is and Mentawai Is, off W Sumatra.

G. r. palawanensis (Sharpe, 1890) – Palawan (W Philippines).

G. r. venerata Bonaparte, 1850 – Lesser Sundas from Lombok and Sumbawa E to Pantar and Alor. Introduced populations (probably nominate race) established in SE USA (Florida), Puerto Rico and Hawaii.



Descriptive notes. 30 cm; 161–229 g. Large black myna with prominent bare yellow patches of skin on head. Nominate race has bare yellow patch below eye, and line of bare yellow skin from just behind eye backwards around nape, where it extends into two pendulous yellow wattles; plumage mostly black, with purple gloss on head, throat and mantle, and turquoise to bronzy sheen on rump and breast; lower belly glossy turquoise; wing black with purple gloss, outermost large primary (P9) with white patch on inner web, primaries P4–8 with white patch on both webs, primary P3 with white on outer web only; iris brown; bill orange to red, yellow tip; legs chrome-yellow. Sexes alike. Juvenile much less glossy, with wattles smaller. Races differ mainly in pattern of bare patches on head, in nature of glossiness of plumage, and in size: *intermedia* smaller than nominate, more bronzy on breast and upper back, bill smaller, upper mandible less curved, bare skin of eye and nape joined but not extending around back of nape; *peninsularis* slightly smaller than previous, with smaller and finer bill; *andamensis* has bare skin of eye and nape joined or only narrowly separated, white in wing sometimes extending to primary P2, bill longer and less curved than that of nominate; *batuensis* larger than nominate; *palawanensis* slightly smaller than nominate, bill shorter but deep, back, rump and underparts more bluish and bronzy, bare patches below and behind eye separated, wattles slightly separated; *venerata* glossier than nominate, bare skin behind eye larger, joined to broad wattles, and extending upwards to hindcrown. Voice. Four categories of call described: "chip-calls", short descending squeaks, loud and piercing, given in alarm or for long-distance communication with conspecifics; "um-sounds", soft nasal noises as close-range contact; "whisper-whistles", soft high-pitched sounds from perched individuals, possibly equivalent of song; and calls comprising a great variety whistles, wails, croaks and shrieks, given by individuals on seeing or hearing each other. Imitates conspecifics (but not sounds of other bird species or other animals). Captives famed for accurate imitation of human voice, but learning dependent on close association with human care-giver and isolation from own species; in aviaries, vocalization and mimicry an expression of dominance.

Habitat. Regions with large trees, evergreen or deciduous, high rainfall and high humidity; edges of forest and disturbed areas often utilized, also cultivated areas where large trees maintained. Favours forest patches over dense forest. Lowlands and hills, mainly to 1370 m; sometimes to 2000 m in Indian Subcontinent.

Food and Feeding. Diet primarily fruit, also nectar, and insects and other small animal food, even small vertebrates (lizards). Figs (*Ficus*) an important component of diet, also other fruit (including spiny palm *Orchosparra tigillaria*) and berries up to 2 cm in diameter; stones regurgitated (and may assist in plant's seed dispersal). Nectar recorded as taken from flowers of *Bombax*, *Erythrina*, *Grevillea* and *Helicteres isora*. Geckos (Gekkonidae) taken on tree trunks, especially when feeding young. Frequently feeds in flowering trees, when face becomes dusted with pollen (may play a role in pollination). Insects gleaned from foliage; winged termites (Isoptera) hawked in flight. Often in pairs; sometimes in flocks, occasionally large numbers gathering at fruiting trees.

Breeding. Season Apr–Jul in India, Sept–Jul in SE Asia (mainly Jan–Jul in Thailand, Feb-Jul in Malaysia); recorded in Dec in Java, Aug in Philippines; up to three broods per season. Monogamous; may pair for life. Nest built by both sexes, a pad of leaves, small twigs and feathers, with fresh leaves added during incubation, placed at least 10 m above ground in hole in tall tree at edge of clearing or in open area, often old hole of woodpecker (Picidae) or parakeet (Psitaccidae); may nest in association with other species, e.g. Vernal Hanging-parrot (*Loriculus vernalis*); nest reused in successive years. Clutch 2–3 eggs, blue to greenish blue, with variable reddish-brown and chocolate-brown blotches; incubation by both sexes, female doing greater share of the work, period 13–17 days; chicks fed by both parents, nestling period 25–28 days; as adults begin new brood soon after young leave nest, young presumably take short time to reach independence. At nests in Thailand during 1991–1998, 308 (79%) of 389 eggs hatched but only 37 young fledged (12% of hatchlings), with 49 chicks lost to predators, at least 188 taken by humans and 34 lost through unknown cause; in following year at protected nests, hatching success again 80%, but 44 chicks fledged from 55 eggs, with 25% of chicks lost to predators or through unknown cause; clearly, human interference was the major factor influencing breeding success at this site. Parasitized by Common Koel (*Eudynamys scolopacea*) in Philippines.

Movements. Resident; local movements, when large flocks concentrate at fruiting trees.

Status and Conservation. Not globally threatened. Common in Indian Subcontinent; uncommon to locally fairly common in SE Asia; in Lesser Sundas generally local and uncommon, but perhaps more numerous on Flores. Introduced (probably nominate race) in SE USA (Florida), Puerto Rico and Hawaii; also reportedly on Taiwan, but possibly not established there, nor in Florida nor Hawaii; introduction attempt failed on Christmas I (Indian Ocean). Early reports from St Helena (S Atlantic Ocean) may have been erroneous. Has declined throughout natural range owing to heavy exploitation for cagebird trade. Serious concern over reduction of wild populations, and, although this species can be bred successfully in captivity, this unlikely to be feasible on a scale large enough to satisfy demand. Formerly captured for food in NE India; today heavily exploited for cagebird industry, with nestlings collected from artificial nest-sites (such as split bamboos) and natural nest-sites raided. In N India, was a favoured species for local bird-keepers, and other starlings were sometimes dyed black to resemble it. Legal exports from Delhi airport (N India) during 1983–1990 recorded as 26,000 "mynas", but exact species not mentioned; other observers had estimated that, in 1979 alone, 15,000–25,000 "hill mynas" were collected for trade, most as nestlings or fledglings. Estimated 200,000 individuals legally exported from Thailand in period 1967–1971, and rate of human exploitation considered unsustainable in that country.

Bibliography. Ahmed (1997), Ali & Ripley (1972), Archawaranon (1994, 2003, 2005a, 2005b), Archawaranon & Techatraisak (2002), Bertram (1968, 1969, 1970, 1976), Boosey (1957), Chen Fuguan *et al.* (1998), Coates & Bishop (1997), Dickinson *et al.* (1991), Halbaken (1959), Hoogerwerf & Rengers Hora Siccama (1938), Kennedy *et al.* (2000), Klatt & Stefanski (1974), Lekagul & Round (1991), Lever (2005), Lin Rueyshing (2001), Majumdar (1978, 1984a), van Marle & Voous (1988), Mees (1986), Menon (1994), Oberholser (1917b, 1919a, 1919b, 1932), Ouse (1980), duPont (1971), Rahman & Haque (1992), Rasmussen & Anderton (2005b), Rensch (1931), Riley (1929), Ripley (1944), Robson (2000), Smythies & Davison (1999), Sontag (1998), Sontag & Louette (2007), Stresemann (1912b), Wells (2007), White & Bruce (1986).

13. Southern Hill Myna

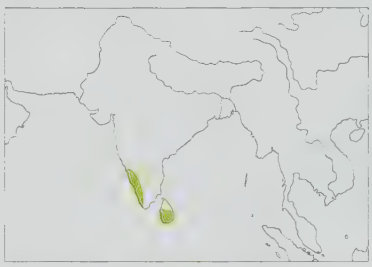
Gracula indica

French: Mainate indien **German**: Indienbeo **Spanish**: Miná Indio

Taxonomy. *Eulabes indicus* Cuvier, 1829, India.

This species, *G. enganensis* and *G. robusta* often treated as conspecific with *G. religiosa*. Monotypic.

Distribution. SW India (C & S Western Ghats) and S region of Sri Lanka.



Descriptive notes. 23–25 cm; 126 g. Medium-sized black myna with bare patch below eye clearly separated from bare postorbital skin, which extends back to nape, where there is a wattle, and forwards over crown to a level opposite eye; wattles on each side do not make contact in mid-line. Plumage mostly black, with forehead and centre of crown glossed purple, body glossed purple and oily green; wing and tail black, white patch on inner web of outer large primary P9, on both webs of P4–P8 and on outer web of P3, forming conspicuous white window in flight; iris dark brown, bare skin on head yellow; bill orange, yellow tip; legs yellow. Sexes alike. Juvenile duller and has smaller and paler wattles. Voice. Loud, piercing musical whistles, and harsh guttural notes; alarm a loud squeaky wheeze, close contact call a soft, lilting squeak; calls generally higher-pitched and less variable than in *G. religiosa*, some resembling sound made by squeaky door hinge, and seem to lack lower-pitched elements of congeners. Wings produce loud hum in flight.

Habitat. Wooded country, including evergreen forest and well-wooded cultivated areas; generally between 300 m and 1300 m, locally to 1700 m.

Food and Feeding. Diet mainly fruit and nectar: fruit of figs (*Ficus*) and berries of sapu tree (*Michelia champaca*) recorded in diet; nectar taken from *Bombax*, *Erythrina*, *Grevillea* trees, and the forest shrub *Helicteres isora*. Forages mainly in treetops. Generally in pairs or small groups; may flock at flowering trees.

Breeding. Season Feb–May in S India and Mar–Sept (mainly Apr–May) in Sri Lanka. Monogamous. Nests in tree hole, usually very high up; clutch 2–3 eggs, greenish blue with brown spots. No other information.

Movements. Resident; some local seasonal movements evident, based on records outside usual range.

Status and Conservation. Not assessed, as often treated as a race of *G. religiosa*. Probably not globally threatened. Locally common. Caught in large numbers for cagebird trade, although has a lesser reputation as a talker, perhaps because most individuals are captured as adults, but also because voice appears to lack lower-pitched elements.

Bibliography. Ali & Ripley (1972), Feare & Craig (1998), Grimmett *et al.* (1998), Henry (1971), Legge (1880), Maringue (1991), Rasmussen & Anderton (2005a, 2005b), de Silva Wijeyeratne (2006), Steinle (1978), Wait (1925).

14. Enggano Hill Myna

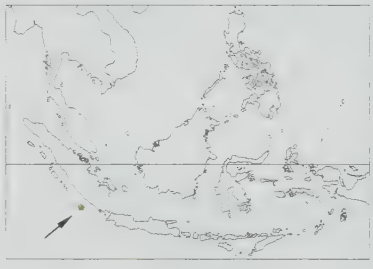
Gracula enganensis

French: Mainate d'Enggano **German**: Engganobeo **Spanish**: Miná de Enggano

Taxonomy. *Gracula enganensis* Salvadori, 1892, Engano Island, Sumatra.

This species and *G. indicus* and *G. robusta* often treated as conspecific with *G. religiosa*. Monotypic.

Distribution. Enggano I, W of S tip of Sumatra.



Descriptive notes. 27 cm. Rather large black myna with small patch of bare skin below eye, bare postorbital skin leading to large wattles which almost join on nape, but no bare skin on crown; feathers of side of head directed upwards to form tuft. Plumage is mostly black, head, neck and mantle strongly glossed purple, rump glossed turquoise; underparts duller, less glossy; wing and tail brownish-black, white patches on inner web of outer primary P9 and both webs of all other primaries, forming large window (larger than that on *G. religiosa*); iris dark brown, bare facial skin and wattles yellow; bill deep and shorter than that of congeners, orange to red with yellow tip; legs yellow. Sexes alike. Juvenile undescribed. Voice. No information.

Habitat. Forested areas.

Food and Feeding. Diet presumably mainly fruit; probably also nectar and insects.

Breeding. No confirmed information.

Movements. Resident.

Status and Conservation. Not assessed. Very poorly known; conservation status not well studied, as often regarded as a race of *G. religiosa*. Tiny global range suggests that population is likely to be small, and this could be a cause for concern; field study required.

Bibliography. Feare & Craig (1998), Hoogerwerf (1963), Stresemann (1912b).

15. Nias Hill Myna

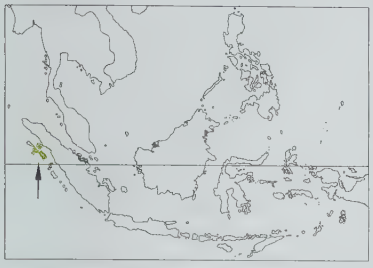
Gracula robusta

French: Mainate de Nias **German**: Niasbeo **Spanish**: Miná de la Nias

Taxonomy. *Gracula robusta* Salvadori, 1887, Nias Island.

This species, *G. indicus* and *G. enganensis* often treated as conspecific with *G. religiosa*. Monotypic.

Distribution. Banyak Is (Babi, Bangkaru and Tuangku) and Nias I, off NW Sumatra.



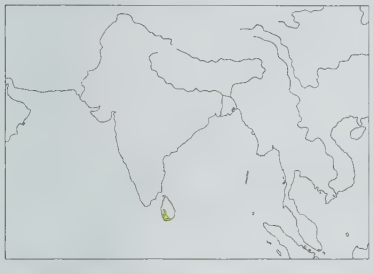
Descriptive notes. 32 cm. Large black myna with heavy and strongly curved bill, and feathers in front of eye directed inwards and upwards, on crown flattened on central line; large patch of bare skin below eye, a separate post-orbital patch forming large wattles on nape which meet in mid-line. Plumage is mostly black, glossed purple on forehead and crown, body with purple gloss, tinged turquoise on rump and belly; wing and tail brownish-black, very large white patches in primaries extending almost to feather bases, white also on secondaries (close to rachis); iris brown, bare facial skin and wattles yellow; bill red, base orange-red and tip yellow; legs yellow. Sexes alike. Juvenile undescribed. Voice. No information; reputed to be an excellent mimic of human speech.
Habitat. Forest in hills away from coast.
Food and Feeding. No published information.
Breeding. In breeding condition in Jun. No other information.
Movements. Resident.
Status and Conservation. Not assessed. Very poorly known; conservation status not well studied, as often regarded as a race of *G. religiosa*. On some islands of this species' small global range, forest clearance, coupled with trapping for the cagebird trade, may have had a serious impact on the population.
Bibliography. Dymond (1994), Feare & Craig (1998), Ripley (1944), Stresemann (1912b).

16. Sri Lanka Hill Myna

Gracula ptilogenys

French: Mainate de Ceylan **German**: Dschungelbeo **Spanish**: Miná Cingalés
Other common names: Sri Lanka Myna, Ceylon Myna/Grackle

Taxonomy. *Gracula ptilogenys* Blyth, 1846, Sri Lanka. Monotypic.
Distribution. SW Sri Lanka.



Descriptive notes. 25 cm. Relatively small black myna, feathers on forehead projecting upwards and forwards, forming small spiky tufts; two separate wattles on nape. Male plumage is essentially black, with narrow band of velvety feathers surrounding eye, body with strong purple gloss; outermost large primary (P9) has white patch on inner web, P4–P8 with white patches on both webs and primary P3 with much-reduced patch on inner web, producing large white wing patch in flight; iris greyish-white with brown speckles, apparently sometimes whitish; nuchal wattles yellow; bill orange-red, bluish to blackish base; legs deep yellow. Female is very like male in plumage, but lower mantle glossed green (not purple), iris coloration always yellowish-white or whitish. Juvenile is browner and less glossy than adult, bill base paler, nuchal wattles much smaller. Voice. Calls include piercing downslurred whistles, also croaking and guttural notes. Captive individuals are good mimics, including imitations of human speech. Wings produce musical hum in flight, audible from moderate distance.
Habitat. Forest or wooded areas, especially rainforest, primarily in tall trees; ventures also into estate plantations and village gardens. To at least 2000 m in hills.
Food and Feeding. Diet primarily fruit, also seeds; fruits of figs (*Ficus*) and wild nutmeg (*Myristica*) recorded. Generally seen in pairs.
Breeding. Season Feb–May, sometimes also Aug–Sept. Monogamous. Nest in tree hole, often above 10 m, cavity unlined, or lined with grass and other vegetation. Clutch 2 eggs. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Sri Lanka EBA. Uncommon and local; common in some places. This species' ability to persist in some secondary and degraded habitats suggests that it may not be at immediate risk. Nestlings often taken for cagebird trade.
Bibliography. Ali & Ripley (1972), Anon. (2008b), Butchart & Stattersfield (2004), Feare & Craig (1998), Grimmett *et al.* (1998), Henry (1971), Jayasekara *et al.* (2003), Legge (1880), Rasmussen & Anderton (2005b), Stattersfield & Capper (2000), Stresemann (1912b), Wait (1925).

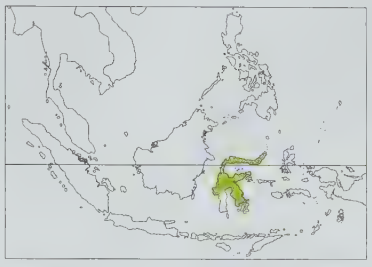
Genus *ENODES* Temminck, 1839

17. Flame-browed Starling

Enodes erythrophris

French: Énode à sourcils rouges **German**: Rotbrauenstar **Spanish**: Estornino Cejirrojo
Other common names: Fiery-browed Myna/Menado Myna, (Celebes) Enodes Myna/Starling, Red-browed Starling

Taxonomy. *Lamprotornis erythrophris* Temminck, 1824, Menado, Sulawesi.
Races possibly represent no more than minor colour variants, and species often treated as monotypic; further study needed. Three subspecies provisionally recognized.
Subspecies and Distribution.
E. e. erythrophris (Temminck, 1824) – N peninsula of Sulawesi.
E. e. centralis Riley, 1920 – NC & SE Sulawesi.
E. e. leptorhynchus Stresemann,1932 – C & S parts of C Sulawesi.
Descriptive notes. 27 cm. Medium-sized starling with tail strongly graduated, with long central rectrices. Has bright orange-red band of feathers from nares backwards over and behind eye, black



patch below and behind eye; rest of head and much of upperparts dark charcoal-grey, rump golden-yellow (feathers elongated); wing olive-green to olive-brown with olive-yellow margins on outer webs of remiges; tail brown, tinged with olive-yellow, terminal 2 cm of central rectrices cream; chin, throat, breast and belly dark charcoal-grey, thighs and undertail-coverts golden-yellow; iris pale yellow or sepia; bill black; legs sulphur-yellow. Sexes alike. Juvenile is browner than adult, with superciliary stripe narrower and yellower, iris brown. Race *centralis* has yellow superciliary stripe, and long, ridged bill; *leptorhynchus* is like nominate, with red eyebrow stripe, but has ridged bill. Voice. Song of male a monotonous, repetitive metallic "zeek zeek". Guttural calls as well as high-pitched "peep" from perched individuals; flight call "tik-tik".
Habitat. Rainforest in montane areas, also lowland and elfin moss forest; occasionally forest edge and selectively logged areas. Most numerous between 1000 m and 1500 m, but occurs up to 2300 m.
Food and Feeding. Omnivorous, diet primarily fruit and invertebrates. Berries and fruit collected in canopy and down to 1 m above ground. Insects gleaned in canopy, from epiphytes and from bark of tree trunks and branches; may hang upside-down while dislodging bark flakes. Forages in pairs, sometimes in trios; occasionally larger flocks, e.g. up to 55 individuals feeding at one time in fruiting fig tree (*Ficus*). At fruiting trees may associate with *Scissirostrum dubium* and *Basilornis celebensis*.
Breeding. No confirmed information. A photograph taken in Aug appears to show an individual of this species emerging from nest-hole with faecal sac, indicating presence of chicks.
Movements. Resident; probably locally nomadic in association with fruiting patterns of forest trees.
Status and Conservation. Not globally threatened. Restricted-range species: present in Sulawesi EBA. Generally common and fairly widespread, but somewhat local. Poorly known. Occurs in Dumoga Bone and Lore Lindu National Parks.
Bibliography. van den Berg & Bosman (1986), Blasius (1897), Coates & Bishop (1997), Riley & Mole (2001), Stresemann & Heinrich (1940b), Vorderman (1898a), Watling (1983), White & Bruce (1986).

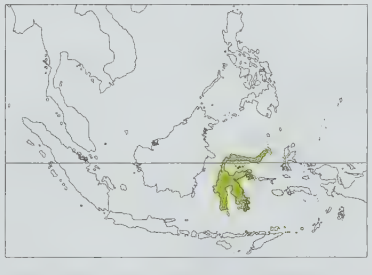
Genus *SCISSIROSTRUM* Lafresnaye, 1845

18. Grosbeak Starling

Scissirostrum dubium

French: Scissirostre des Célèbes **German**: Finkenschnabelstar **Spanish**: Estornino Culipinto
Other common names: Celebes/Latham's Myna, Finch-billed Myna/Starling, Scissor-billed/Woodpecker Starling

Taxonomy. *Lanius dubius* Latham, 1801, locality unknown = Sulawesi.
Birds from Peleng described as race *pelingense*, but considered inseparable from those eslewhere in species' range. Monotypic.
Distribution. Sulawesi and nearby islands of Bangka, Lembeh, Togian Is, Buton, and Banggai Is (Peleng, Banggai).



Descriptive notes. 20 cm; 50 g. Smallish starling with massive bill. Plumage is mostly dark grey, darker on wing and tail; rump and uppertail-covert feathers, and some feathers on flanks, are elongated, with stiff, waxy tips which are bright red (sometimes faded to orange); iris very dark brown; bill and legs orange-yellow. Sexes alike. Juvenile is mouse-brown, with red or orange feather tips on rump, uppertail-coverts and flanks, iris blackish, bill slender and paler than that of adult, newly fledged individuals had yellow bill and pink legs. Voice. Song in courtship opens with chuckling notes, followed by loud whistles. Harsh rasping "schirr" calls, in flight a liquid "chiruip", nasal chatter, and repeated high-pitched "swee"; feeding groups gave whistled "wrriu"; soft chirruping from perched birds in aviary. Very noisy at colonies and in flocks; calls frequently in flight.
Habitat. Generally at forest edge and in lightly wooded areas; more common in modified habitats, and most frequently encountered in plantations. Relatively uncommon in primary forest and evidently absent in secondary forest. Sea-level to 1000 m, occasionally to 1100 m.
Food and Feeding. Diet fruit, seeds and insects; fruits taken include those of figs (*Ficus*) and *Albizzia*, and bird's-eye chilli (*Capsicum frutescens*). Spends most time in upper canopy; captives descend to ground infrequently for food or water. Highly gregarious; lives in medium-sized to large flocks of up to 150 individuals; forages often in association with *Aplonis minor*.
Breeding. Breeding recorded in May; captives nested in spring and summer in Europe. Monogamous. Colonial breeder, colonies containing up to hundreds of nests, pairs highly synchronized. Nest-hole bored in manner of woodpecker (Picidae) in dead wood in trunk more than 30 cm in diameter, at least 10 m above ground, cavity lined by both male and female with grass and leaves (nest-holes apparently utilized throughout year for roosting); large number of nests in same tree can weaken tree until it collapses; in captivity, pair used green leaves in courtship and in nest-building, and one captive pair lined a nestbox with thin strips of newspaper. Clutch 2 eggs, pale blue with brown speckles or reddish-brown patches concentrated at thicker end; in captivity two females each laid 2 eggs in same nest; incubation by both sexes, 13–14 days; chicks fed by both parents, apparently by regurgitation, nestling period 21–23 days; in captivity, adults continued to feed young for five weeks after fledging. Wild pairs apparently produced only one young per nest.
Movements. Resident; local movements for foraging purposes.
Status and Conservation. Not globally threatened. Widespread and common to locally very common. Breeds readily in captivity. Occurs in several protected areas, e.g. Dumoga Bone National Park.
Bibliography. Bartsch (2001), Blasius (1897), Bockheim & Congdon (2001), Coates & Bishop (1997), Hof (1987), Kraus (1985), Meier (1991), Meyer & Wigglesworth (1898), Peck (1985), Sodhi, Koh *et al.* (2005), Stresemann & Heinrich (1940b), Vorderman (1898a), Watling (1983), Wennrich (1982), White & Bruce (1986), Wiles & Masala (1987).


PLATE 41
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cm 10
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23
24
ssp magna
ssp brevicauda
25
ssp grandis
26
27
28
ssp malaitae
ssp maxwellii
29
ssp zelandica
ssp rufipennis
ssp atronitens
♂
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31
♂
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ssp striata
ssp albiris
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ssp sanghirensis
ssp panayensis
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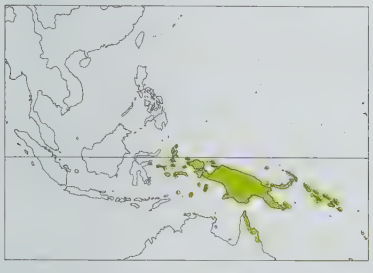
Genus *APLONIS* Gould, 1836

19. Shining Starling

Aplonis metallica

French: Stourne luisant **German**: Weberstar **Spanish**: Estornino Lustroso
Other common names: Metallic/Colonial Starling

Taxonomy. *Lamprotornis metallica* Temminck, 1824, "Timor and Celebes" = Ambon.
Genus name sometimes given as *Aplornis* (see page 659). Was previously thought to form a superspecies with *A. magna*. Five subspecies recognized.
Subspecies and Distribution.
A. m. metallica (Temminck, 1824) – Moluccas (including Sula Is), New Guinea and most satellite islands, Aru Is, and NE Australia (NE Queensland).
A. m. inornata (Salvadori, 1881) – Numfor and Biak, in N Geelvink Bay (NW New Guinea).
A. m. circumscripta (A. B. Meyer, 1884) – E Lesser Sundas (Damar and Tanimbar Is).
A. m. purpureiceps (Salvadori, 1878) – Admiralty Is (NW Bismarck Archipelago).
A. m. nitida (G. R. Gray, 1858) – Bismarck Archipelago (except NW) and Solomon Is.



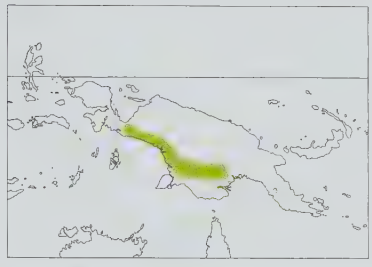
Descriptive notes. 25 cm; 48–67 g. Medium-sized starling with long graduated tail, and with long, lanceolate feathers on nape, and prominent red eye; black plumage with variable gloss. Nominate race has crown glossed purple, nape glossy satin-green with long, lanceolate feathers, mantle glossy purple, rump glossy emerald-green; wing brownish-black with some bluish iridescence, tail black with some gloss; throat glossy satin-green, upper breast glossy purple, lower breast and belly glossy emerald-green; iris red to orange-red; bill and legs black. Sexes alike. Juvenile is chocolate-brown above, wings blackish-brown with a little gloss, tail chocolate-brown, chin and throat buffy with brown shaft streaks, breast and belly brown with broad pale buff feather margins; iris dark brown, changing progressively through olive-yellow, yellowish-green and greenish-orange to adult colour. Race *circumstripta* is glossed reddish-purple on head, mantle and breast; *nitida* has bronze (rather than green) iridescence; *purpureiceps* is smaller and shorter-tailed, less glossy on head, and lacks purple on mantle; *inornata* is smaller and duller than nominate, lacking green on nape, having head, neck and mantle tinged purple, with almost no purple on upper breast. Voice. Song short and fluty in tone, described as being likae that of Island Canary (*Serinus canaria*); may include mimicry of other species, such as Hooded Pitta (*Pitta sordida*) and Common Koel (*Eudynamys scolopacea*). Flight call a descending nasal note; constant loud twittering at colonies, and returning individuals give high-pitched twittering call; also harsh and whistling calls, said to resemble those of congeners; harsh chattering heard from juveniles.
Habitat. Rainforest, coastal woodland, mangroves, also forest edge and clearings, gardens; visits fruiting trees in savanna. Usually below 1000 m, but recorded above 3000 m in E New Guinea.
Food and Feeding. Mainly frugivorous; also takes nectar, some insects. Fruits recorded as taken in Australia include those of native trees *Carallia brachiata*, *Myristica insipida*, *Schefflera actinophylla*, *Terminalia seriocarpa*, *Glochidion harveyanum*, *Glochidion ferdinandii*, *Polyscias elegans*, *Polyscias murrayi*, *Phycosperma elegans*, *Archontophoenis alexandrae*, *Scaevola koenigii*; also of exotic *Pinanga khulii* and *Capsicum frutescens*. Feeds on caterpillars (Lepidoptera); hawks flying ants and wasps (Hymenoptera) and mayflies (Ephemeroptera). Forages usually in small to large flocks of up to several hundred individuals, very occasionally in ones or twos; commonly associates with fruit doves (*Ptilinopus*), sometimes in mixed-species flocks with *A. mysolensis* (on Seram) and *A. mystacea* (in New Guinea). Roosts communally, performing complex aerial manoeuvres in flocks.
Breeding. In E New Guinea mostly Jul–Oct (Jul–Feb around Port Moresby), but Mar–May in some areas; Aug–Jan in NE Australia; apparently up to three successive broods at same colony, but not clear if same individual birds involved; captive pair in USA bred in all seasons. Presumed monogamous; possibly co-operative breeder at times, e.g. three adults working on one nest. Colonial breeder, with 4–400 nests often in single tree; adjoining nests can coalesce to form single structure. Domed nest with side entrance, made from twigs, vine tendrils and bark strips, lined with strips of palm frond and fresh green leaves, suspended 10–30 m above ground from ends of twigs in canopy. Clutch 1–4 eggs, pale blue, variably spotted and blotched with rufous and greyish-mauve markings; incubation possibly by female alone; chicks fed by both sexes, both by regurgitation and with food carried in bill; no information on duration of incubation and nestling periods.
Movements. Mainly resident or nomadic. Largely breeding visitor (mostly Jul–Feb/Mar) in NE Australia, spending non-breeding season in New Guinea; some may be present throughout year.
Status and Conservation. Not globally threatened. Common; abundant in many areas. In New Guinea, some colonies are treated as a traditional food source by humans, where certain individuals had the right to harvest nestlings; in Australia, likerwise, young were formerly collected for food by Aboriginals. This species features less in the trade in wild birds than do other members of genus.
Bibliography. Amadon (1956), Banfield (1912), Beecher (1945), Beehler (1978b), Bell, H.L. (1984b, 1986), Bishop & Brickle (1999), Blaber (1990), Blakers *et al.* (1984), Bockheim & Congdon (2001), Cain & Galbraith (1956), Clapp (1987), Coates (1985, 1990), Coates & Bishop (1997), Draffan *et al.* (1983), Gilliard & LeCroy (1966), Hadden (2004), Hartert (1926), Higgins *et al.* (2006b), LeCroy (1981a), LeCroy *et al.* (1984), Madarász (1897), Magarry (1987), Mayr & Diamond (2001), Mees (1982), Meyer, A.B. (1884), Meyer, P.O. (1933), Ogilvie-Grant (1915), Pavey (1991), Rand (1942a), Rand & Gilliard (1967), Reilly (1988), Schodde (1977), Schodde & Mason (1999), Sticklen (1981), Stresemann (1912a, 1914), Vorderman (1898b), White & Bruce (1986).

20. Yellow-eyed Starling

Aplonis mystacea

French: Stourne de Grant **German**: Mimikastar **Spanish**: Estornino Ojigualdo

Taxonomy. *Calornis mystacea* Ogilvie-Grant, 1911, Parimau, Mimika River, New Guinea.
Genus name sometimes given as *Aplornis* (see page 659). Monotypic.
Distribution. Discontinuously in W & SC New Guinea.



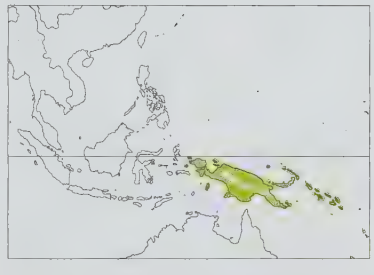
Descriptive notes. 18 cm. Medium-sized starling with rather long, graduated tail; bristly forehead feathers forming partly erectile crest (visible in field), and feathers of crown, nape, throat and upper breast elongated and lanceolate. Plumage is mostly black, glossed purple on head and mantle, glossed emerald-green on rump and wing-coverts, and glossed bronzy green on breast, belly and flanks; flight-feathers dark brown, some gloss on outer webs, tail dark brown and slightly glossy; iris pale yellow; bill and legs black. Sexes alike. Juvenile undescribed. Voice. Calls include harsh and bell-like notes; not properly distinguished from *Aplonis metallica* in most descriptions. High-pitched chattering at breeding colony.
Habitat. Forest, primarily lowland alluvial forest; reported also in hill forest to at least 300 m.
Food and Feeding. Diet presumably mainly fruit; red berries fed to young. Forages in canopy of lowland-forest trees such as *Endospermum moluccanum*. Generally in small groups, sometimes in larger flocks of up to c. 100 individuals; often in mixed flocks with *A. metallica*.
Breeding. Season apparently not documented. Colonial. One colony known, contained c. 150 nests: nest an untidy, mostly globular structure of strips of vegetation, suspended from or sometimes supported by branch, often in clusters of c. 15 nests, in forest tree c. 30 m tall. No other information.
Movements. Presumed resident; possibly nomadic.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Poorly known species, and status unclear because of close resemblance to *A. metallica*. Confirmed records from only a handful of localities: from R Wanggar and R Mimika in W, from middle R Turama and upper R Fly catchment, and, in SE, from R Nagore. Colonies sometimes destroyed by local human inhabitants, who collect adults, young and eggs for food.
Bibliography. Anon. (2008b), Beehler & Bino (1995), Butchart & Stattersfield (2004), Coates (1990), Feare & Craig (1998), Hartert *et al.* (1936), Ogilvie-Grant (1915), Rand (1938a), Rand & Gilliard (1967), Safford (1996), Stattersfield & Capper (2000).

21. Singing Starling

Aplonis cantoroides

French: Stourne chanteur **German**: Singstar **Spanish**: Estornino Cantor
Other common names: Little Starling

Taxonomy. *Calornis cantoroides* G. R. Gray, 1862, Misool, West Papuan Islands.
Genus name sometimes given as *Aplornis* (see page 659). May form a superspecies with *A. crassa*. Monotypic.
Distribution. West Papuan Is, New Guinea and some satellite islands, Aru Is, Bismarck Archipelago and Solomon Is.



Descriptive notes. 18 cm; 50–62 g. Medium-sized starling with bristly forehead feathers, and with feathers of crown and, particularly, throat hackled. Plumage is black with strong green iridescence, wing and tail black with some iridescence; iris red or orange; bill and legs black. Sexes alike. Juvenile differs from adult in having crown and upperparts dark brown with some green gloss, throat hackles pale buff with dark brown shafts, breast and belly feathers dark-centred with buff margins, broader buff area towards vent, brown iris. Voice. Song a short melodious whistle. Flight call a rustling sound resembling call of White-bellied Cuckoo-shrike (*Coracina papuensis*); creaking notes during foraging, and "pee wee" by feeding juveniles; "tiu tiu" call by adults at nest; other common calls are a repeated rising "su weii" and downward-inflected "siiew".
Habitat. In New Guinea found in wide range of natural and modified habitats, including urban areas; mainly in lowlands, up to 1700 m in mountain valleys. Primarily in forest on some islands.
Food and Feeding. Fruit, also insects. Fruits taken include figs (*Ficus*), fruit from forest palms, papaya (*Carica papaya*) and bird's-eye chilli (*Capsicum frutescens*). Hawks flying insects. Forages in pairs and small flocks, immatures also in large flocks; often feeds in association with *A. metallica*.
Breeding. Determination of season difficult owing to presence of individuals around nesting areas through much of year; recorded Sept–Feb in New Guinea (Sept–Dec around Port Moresby), and in Mar and Aug on smaller islands. Presumed monogamous. Sometimes breeds colonially. Nest in hole, usually in dead or living tree, sometimes in cliff, coral rock, or building or other man-made structure, lining material includes grass and plant fibres; sometimes occupies same trees as those used by *A. metallica*. Clutch 2–3 eggs, pale blue, spotted with brown and violet. No other information.
Movements. Increased abundance in New Guinea highlands during Apr–Nov suggests possible altitudinal migration. Flocks of juveniles may be nomadic; lack of geographical differentiation in populations also implies regular interchange between areas.
Status and Conservation. Not globally threatened. Widespread and common in New Guinea, as well as in several island groups. Reportedly extending its range into cultivated areas and colonizing some towns in montane areas.
Bibliography. Beecher (1945), Blaber (1990), Bradley & Wolff (1956), Cain & Galbraith (1956), Carter *et al.* (1997), Coates (1990), Diamond (1972), Finch (1986), Hadden (1981, 2004), Hartert (1926), Heinroth (1903), Higgins *et al.* (2006b), Hunter (1996), LeCroy (1981a), Mayr (1942), Mayr & Diamond (2001), Meyer (1929, 1933), Mitchell (1988), Rand & Gilliard (1967), Roberts (1996) Schodde (1977).

On following pages: 22. Tanimbar Starling (*Aplonis crassa*); 23. Atoll Starling (*Aplonis feadensis*); 24. Rennell Starling (*Aplonis insularis*); 25. Long-tailed Starling (*Aplonis magna*); 26. White-eyed Starling (*Aplonis brunneicapillus*); 27. Brown-winged Starling (*Aplonis grandis*); 28. Makira Starling (*Aplonis dichroa*); 29. Rusty-winged Starling (*Aplonis zelandica*); 30. Striated Starling (*Aplonis striata*); 31. Mountain Starling (*Aplonis santovestris*); 32. Asian Glossy Starling (*Aplonis panayensis*); 33. Moluccan Starling (*Aplonis mysolensis*); 34. Short-tailed Starling (*Aplonis minor*); 35. Micronesian Starling (*Aplonis opaca*); 36. Pohnpei Starling (*Aplonis pelzelni*).

22. Tanimbar Starling

Aplonis crassa

French: Stourne des Tanimbar **German**: Tanimbarstar **Spanish**: Estornino de las Tanimbar

Taxonomy. *Calornis crassa* P. L. Sclater, 1883, Larat, Tanimbar Islands.
Genus name sometimes given as *Aplornis* (see page 659). May form a superspecies with *A. cantoroides*. Monotypic.
Distribution. Tanimbar Is, in extreme E Lesser Sundas.



Descriptive notes. 20 cm. Medium-sized starling with comparatively sturdy bill, and with lanceolate feathers on crown and throat. Head and body are dark charcoal-black glossed with metallic green, slightly paler and less glossy ventrally; wing and tail dark brown with little gloss; iris dark brown; bill and legs black. Sexes alike. Juvenile is mousy brown above, with some greenish gloss on head, buff below, with dark shafts of throat feathers, and dark feather centres on breast and belly producing heavy streaking. Voice. Cacophony of piping, metallic calls from flocks; similar calls repeated at intervals by individual birds.
Habitat. Wooded areas, including secondary forest and woodland edge, and mangroves.
Food and Feeding. Diet fruit, probably also insects and nectar. Forages in dense crowns of flowering and fruiting trees. Forages singly, in pairs or in small groups, also in flocks of up to c. 200 individuals.
Breeding. No published information.
Movements. Presumed to be resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Banda Sea Islands EBA. Locally common in suitable habitat; has very small global range, and is vulnerable to habitat change. Heavy logging taking place in S part of Yamdena I, but it is tolerant of secondary and edge habitats. Protection of areas of suitable habitat recommended.
Bibliography. Anon. (2008b), Bishop & Brickle (1999), Butchart & Stattersfield (2004), Coates & Bishop (1997), Feare & Craig (1998), Stattersfield & Capper (2000), White & Bruce (1986).

23. Atoll Starling

Aplonis feadensis

French: Stourne des Fead **German**: Atollstar **Spanish**: Estornino de los Atolones
Other common names: Fead Island Starling

Taxonomy. *Calornis* (*Aplonis*) *feadensis* E. P. Ramsay, 1882, Fead, Nuguria Islands, east of Bismarck Archipelago.
Genus name sometimes given as *Aplornis* (see page 659). May form a superspecies with *A. insularis*; formerly considered conspecific, but is structurally and vocally distinct. Two subspecies recognized.
Subspecies and Distribution.
A. f. heureka Meise, 1929 – Ninigo Group, Hermit Is and Tench I (St Matthias Group), off NW & N Bismarck Archipelago.
A. f. feadensis (E. P. Ramsay, 1882) – Nissan I and Nuguria Is (E of New Ireland), Mortlocks and Carterets (E of Bougainville), and Ontong Java Atoll (N Solomon Is).



Descriptive notes. 20 cm; 72 g. Medium-sized starling with forehead feathers slightly bristly. Head and body are black, glossed with turquoise-green, wing and tail brownish-black with some gloss; iris yellow or dark yellow (one description suggests dark iris with pale yellow eyering); bill and legs black. Sexes alike. Juvenile lacks gloss on upperparts, has pale feather edges on underparts giving scaly effect, iris blue, becoming green. Races differ minimally: *heureka* has thinner bill and longer tail than nominate. Voice. Commonest call a loud ascending "weee-eeee"; softer calls resemble those of white-eyes (*Zosterops*). Song a rapid jumble of notes.
Habitat. Forest, forest edge and coconut (*Cocos nucifera*) groves; often found around gardens near forest, and readily enters gardens to exploit fruit trees.
Food and Feeding. Diet berries and insects. Forages in canopy; also at lower levels at forest edge, where sometimes descends to ground to feed. Gleans insects from leaves. In pairs or small flocks.
Breeding. Breeds Jun–Jul (young in nest). Nest in hole 5–10 m above ground in old tree or coconut stump. Clutch 2 eggs, pale blue, with reddish brown spots concentrated at thicker end; both adults seen to feed young. No other information.
Movements. Presumed resident, although individual seen flying between islands in Ninigo Group.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in New Britain and New Ireland EBA and in Ontong Java Atoll Secondary Area. Fairly common, but small population with total area of distribution probably no more than c. 64 km², spread over many small islets. Day counts on Tench of c. 30 individuals in 1998 and 15 in 1999; day counts of c. 30 on Nissan in 1998. Main potential threats are natural events such as cyclone damage and colonization of islands by *A. cantoroides*, compounded by continued habitat modification. With the exception of Nissan (37 km²), all islands inhabited by present species are tiny (less than 10 km² in surface area), and the small and fragmented forested habitats remaining on them are subject to high human population pressure; large areas already cleared for agriculture and coconut plantations. The species' apparent dependence on holes for nesting may be a limiting factor. In addition, as most of the islands which it inhabits are low (reaching only a few metres above sea-level), it is potentially at risk from climate change.
Bibliography. Anon. (2008b), Bayliss-Smith (1972), Bell (1975), Bradley & Wolff (1956), Butchart & Stattersfield (2004), Coates (1990), Dutson (2008b), Feare & Craig (1998), Finch (1986), Hadden (1981, 2004), Mayr & Diamond (2001), Stattersfield & Capper (2000).

24. Rennell Starling

Aplonis insularis

French: Stourne de Rennell **German**: Rennellstar **Spanish**: Estornino de la Rennell

Taxonomy. *Aplonis insularis* Mayr, 1931, Rennell, Solomon Islands.
Genus name sometimes given as *Aplornis* (see page 659). May form a superspecies with *A. feadensis*; formerly considered conspecific, but is structurally and vocally distinct. Monotypic.
Distribution. Rennell, in S Solomon Is.



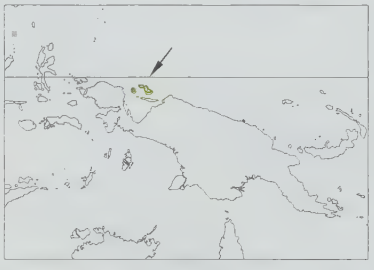
Descriptive notes. 19 cm; 66–74 g. Medium-sized, short-tailed starling with lanceolate throat feathers. Head and body are black, feathers of head, mantle, rump, throat and breast edged glossy blue-purple, belly and undertail-coverts matt black; wing and tail dark brown; iris yellow or orange-yellow; bill and legs black. Sexes alike. Juvenile is uniformly rich chocolate-brown, with slight metallic sheen on head produced by narrow glossy edges of feathers, iris brownish-grey, legs dark grey. Voice. Song a musical series of varied metallic notes, resembling those of *A. cantoroides* but less melodic. Flight call a sharp, metallic "chink".
Habitat. Forest edge, less often in forest and gardens.
Food and Feeding. Little information. Fruit, including figs (*Ficus*) and larger fruits such as papaya (*Carica papaya*); also insects and land snails (Gastropoda). Forages mostly in canopy, also descending to lower levels to feed in low shrubs and on ground. Shells of snails broken by being hammered against an "anvil". Observed generally in pairs.
Breeding. Nest in stump of coconut palm (*Cocos nucifera*) or hole in decayed tree; only clutch known was of 3 eggs, pale blue-green with red-brown blotches at the thicker end. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Rennell and Bellona EBA. Uncommon, but status not well known. Range tiny, so species potentially vulnerable.
Bibliography. Bradley & Wolff (1956), Diamond (1991), Dutson (2008b), Feare & Craig (1998), Finch (1986), Mayr (1931a).

25. Long-tailed Starling

Aplonis magna

French: Stourne à longue queue **German**: Biakstar **Spanish**: Estornino de la Biak

Taxonomy. *Lamprotornis magnus* Schlegel, 1871, Soëk, Misori (= Biak Island), New Guinea.
Genus name sometimes given as *Aplornis* (see page 659). Was previously thought to form a superspecies with *A. metallica*. Two subspecies recognized.
Subspecies and Distribution.
A. m. brevicauda (van Oort, 1908) – Numfor I, in NW Geelvink Bay (NW New Guinea).
A. m. magna (Schlegel, 1871) – Biak I, in N Geelvink Bay.



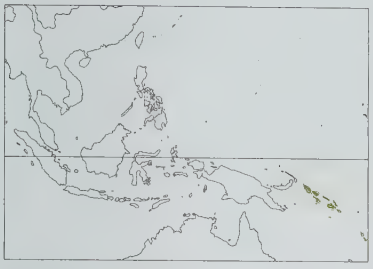
Descriptive notes. 28–41 cm (including tail). Large starling with long tail (central four feathers greatly elongated); forehead feathers bristly, feathers of crown and throat lanceolate. Nominate race has head and body black, glossed oily green, bronze gloss on head; remiges blackish-brown; tail as long as or longer than body, dark brown; iris brown; bill and legs black. Sexes alike. Juvenile undescribed. Race *brevicauda* is less glossy than nominate and has much shorter tail, about two-thirds of body length. Voice. Series of loud warbles; call a shrill slurred "cheeuw" on descending scale.
Habitat. Forest, secondary woodland, forest edge and gardens, at all altitudes.
Food and Feeding. Fruit. Forages in trees and undergrowth. Occurs in pairs and in small groups.
Breeding. Nest high up in tree. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Geelvink Islands EBA. Tiny global range, consisting of two islands. Reported as abundant on both islands.
Bibliography. Beehler *et al.* (1986), Coates (1990), Feare & Craig (1998), Harrison & Greensmith (1993), Rand & Gilliard (1967).

26. White-eyed Starling

Aplonis brunneicapillus

French: Stourne aux yeux blancs **German**: Weißaugenstar **Spanish**: Estornino Ojiblanco

Taxonomy. *Rhinopsar brunneicapillus* Danis, 1938, Buin, Bougainville.
Genus name sometimes given as *Aplornis* (see page 659). Monotypic.
Distribution. Bougainville, Choiseul, Rendova and Guadalcanal, in Solomon Is.
Descriptive notes. 23 cm; 59–77 g. Medium-sized, pale-eyed starling with small frontal crest formed by degenerate feathers of forehead, deep bill with strongly curved upper mandible, elongated crown and throat feathers; two central tail feathers greatly elongated. Male has black plumage with crown glossed bronze, lores purple-bronze, chin and throat iridescent purple, moustachial stripe emerald-green; mantle, upperwing-coverts, rump, breast and belly iridescent emerald-green; primaries and secondaries blackish-brown, purple gloss on outer webs; tail glossy black, central feather pair up to three times the length of outer rectrices; iris white; bill and legs black. Female is like male but slightly less iridescent, with elongated central rectrices shorter. Juvenile lacks frontal crest and tail extensions, has crown and nape dark purplish, mantle and rump glossed green, wings and tail glossed blue, underparts blackish-brown with some green feathers tips, white streaking on breast and centre of belly, iris olive to dark brown, bill less arched; bill initially grey, becoming black in older immatures. Voice. Calls described at nesting colony include "chreep" in courtship,



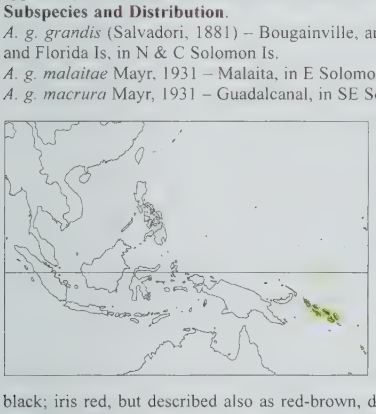
and whistled "kah kwik-kwik-kwik-kwik-chu-er" sequence (possibly song) during display at nest; harsh "kwaik" in alarm and "chk chk" chatter in aggressive encounters; whistled "kwee kwee chee-er" in flight by birds when returning to colony.
Habitat. Forest, including both lowland forest and hill forest to at least 800 m, and swamp-forest, also forest edge and second growth; also gardens, and trees in clearings.
Food and Feeding. Diet mainly fruit, including figs (*Ficus*), and fruits with large stones (which are presumably regurgitated). Forages mostly in canopy; also down to lower levels in gardens and around clearings. Generally in small flocks.
Breeding. Recorded in Jan on Bougainville and Jul–Aug on Guadalcanal. Presumed monogamous. Colonial; colonies of 10–40 nests in isolated trees. Nest consists of short horizontal tunnel, lined with moss, built among epiphytes on branches in canopy of tree. Eggs whitish, speckled with grey and chocolate-brown. Adults seen to carry food in bill to nestlings; latter preyed on by Pied Goshawk (*Accipiter albogularis*). No other information.
Movements. Presumed resident.
Status and Conservation. ENDANGERED. Restricted-range species: present in Solomon Group EBA. Rare and patchily distributed, with few recent records; poorly known. Total population estimated at fewer than 2500 individuals and believed declining. On Bougainville, single specimens taken in 1938 and 1944; colony of at least ten pairs in 1985, but not found two years later. Recorded at a single locality on Choiseul in 1994. On Rendova, one specimen taken in 1943 and records of two individuals in 1980s and some in 1990s. On Guadalcanal, 41 specimens collected in 1953 at Betilonga (in WC of island), but the species appears now to be extirpated there; a few recent records at Komarindi (in NW) and at Mt Austen (in N). Deforestation is increasing in Solomons, and most lowland forest and much hill forest throughout the species' range has been or is scheduled to be logged. No significant protected areas within its range; Mt Austen lies within the Queen Elizabeth National Park, but this is unprotected and highly degraded. In the past, local human inhabitants harvested nestlings for food, and this practice may continue.
Bibliography. Amadon (1956), Anon. (2008b), Beecher (1945), Butchart & Stattersfield (2004), Cain & Galbraith (1956), Coates (1990), David & Gosselin (2002a), Finch (1985, 1986), Gibbs (1996), Hadden (2004), Kaestner (1987), Mayr & Diamond (2001), Stattersfield & Capper (2000).

27. Brown-winged Starling

Aplonis grandis

French: Stourne des Salomon **German**: Kragenstar **Spanish**: Estornino de las Salomón
Other common names: Large Glossy Starling

Taxonomy. *Lamprocorax grandis* Salvadori, 1881, Santa Isabel, Solomon Islands.
Genus name sometimes given as *Aplornis* (see page 659). May form a superspecies with *A. dichroa*; formerly regarded as conspecific, but differs in size, morphology and plumage. Race *malaitae* may constitute a separate species, differing in morphology (smaller size, shorter tail, slimmer structure), white (or very pale blue) iris, distinct green gloss on head and body, shorter neck hackles, and apparently voice (some territorial calls); further study required. Three subspecies recognized.
Subspecies and Distribution.
A. g. grandis (Salvadori, 1881) – Bougainville, and Choiseul, Santa Isabel, New Georgia Group and Florida Is, in N & C Solomon Is.
A. g. malaitae Mayr, 1931 – Malaita, in E Solomons.
A. g. macrura Mayr, 1931 – Guadalcanal, in SE Solomons.



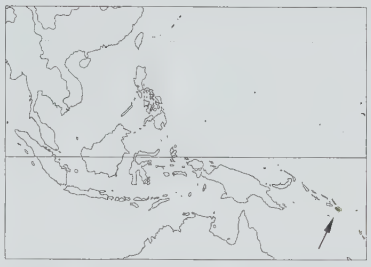
Descriptive notes. 27 cm; 110–151 g. Large starling with medium-length tail, bristly forehead feathers, and greatly elongated lanceolate feathers on crown, nape, throat and upper breast. Nominate race has mostly black plumage, crown to nape, throat and upper breast iridescent purple; mantle glossy green, passing into turquoise-purple iridescence on rump, upperwing coverts glossed bluish-purple; breast oily green, belly, flanks and undertail-coverts glossy bluish-purple; primaries and secondaries dark brown with some iridescence on outer webs, worn feathers paler brown (forming distinct wing patch in flight); tail dark brownish-black; iris red, but described also as red-brown, dark brown or grey-brown (possibly age-related changes); bill and legs black. Sexes alike. Juvenile is generally duller than adult, with lanceolate feathers less elongate, primares duller brown. Race *macrura* is like nominate but with much longer tail, particularly in male; *malaitae* is slimmer, with shorter head and throat hackles, distinct green gloss, whitish iris. VOICE. Song a continuous medley of warbles, chips, squeaks and shrill chattering notes, some at very high frequency; reminiscent of *Sturnus vulgaris* according to some observers. Deep, musical "pink pink"call during foraging; a guttural chirp and click may be contact calls; loud "chik" or "tip" in flight; also high-pitched repeated "hiiew". Loud fanning wing noise in flight.
Habitat. Forest; also secondary vegetation and cleared areas, including villages where some tall trees remain. Generally below 750 m, but on Guadalcanal from sea-level to 1200 m.
Food and Feeding. Fruit; also some insects. Takes pieces from large fruits such as figs (*Ficus*); fruit of *Cananga odorata* noted in diet. Forages high in trees. Usually seen singly or in pairs; occasionally in small flocks on Guadalcanal.
Breeding. May–Sept on Bougainville and Sept–Nov on Kolombangara, and extended season likely; single-brooded. Presumed monogamous; solitary nester. Nest a free-standing bulky mass of twigs, dry leaves, moss and grass, with side entrance, built in fork of tree or in cavity at end of broken branch. Clutch 2–3 eggs, pale green or blue with large brown spots, sometimes coalescing at thicker end. No further information.
Movements. Resident; observed while crossing open sea between islands 2 km apart.
Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Common on most islands in range, and occupies both primary forest and man-modified areas. Not thought to be at any risk, at least in near future.
Bibliography. Baker (1948), Blaber (1990), Cain & Galbraith (1956), Coates (1990), Diamond (2002), Dutson (2008b), Finch (1986), Hadden (1981, 2004), Mayr (1931b), Mayr & Diamond (2001), Schodde (1977).

28. Makira Starling

Aplonis dichroa

French: Stourne de San Cristobal **Spanish**: Estornino de San Cristóbal
German: San-Cristobal-Star
Other common names: San Cristobal Starling

Taxonomy. *Calornis dichroa* Tristram, 1895, San Cristobal, Solomon Islands.
Genus name sometimes given as *Aplornis* (see page 659). May form a superspecies with *A. grandis*; formerly regarded as conspecific, but differs in size, morphology and plumage. Monotypic.
Distribution. San Cristobal (Makira), in SE Solomon Is.



Descriptive notes. 20 cm; 73–92 g. Rather small starling with bristly forehead feathers and lanceolate feathers on crown, throat and upper breast. Plumage mostly blackish, with crown, throat and upper breast glossy purple-green, mantle and rump feathers dark brown with glossy bottle-green tips, upperwing-coverts blackish-brown with some gloss; belly and undertail-coverts matt blackish-brown; remiges tawny-brown and unglossed, appearing paler and browner than rest of plumage (especially when worn); tail dark brown; iris red, also orange or tawny (perhaps age-related); bill and legs black. Sexes alike. Juvenile browner and less glossy, with clear contrast between remiges and rest of plumage, iris tawny-orange. VOICE. Song soft and varied, repeated series of upslurred and downslurred notes. Highly vocal, calls include melodious whistles e.g. "wu-ee wu-ee tee" and "te-eu te-eu", a rising whistle, high-pitched squeaks and clicks, soft musical chattering, and harsh "chu-ai". Vocalizations similar to those of three local passerines: San Cristobal Cicadabird (*Coracina salomonis*), Long-tailed Triller (*Lalage leucopyga*) and local race *megarhynchus* of Chestnut-bellied Monarch (*Monarcha castaneiventris*).
Habitat. Forest, especially secondary forest, at all altitudes, but least common on coast; occasionally in more open habitats.
Food and Feeding. Fruit, mostly tiny fruits 1–2 mm in diameter; also seeds. Forages in outer twigs, primarily in canopy; hangs by feet in order to reach food items. Often in small groups of 3–8 individuals; sometimes in larger flocks of up to 30 birds.
Breeding. Monogamous. Builds solitary, compact spherical nest of sticks in dense forest subcanopy. Eggs reportedly whitish, sparingly marked with pale brown flecks. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Solomon Group EBA. Fairly common to locally common. Potentially vulnerable, as restricted to single island.
Bibliography. Cain & Galbraith (1956), Coates (1990), Diamond (2002), Dutson (2008b), Feare & Craig (1998), Finch (1986), Mayr & Diamond (2001).

29. Rusty-winged Starling

Aplonis zelandica

French: Stourne mélanésien **German**: Rostflügelstar **Spanish**: Estornino de Melanesia
Other common names: Rufous-winged/New Hebrides Starling

Taxonomy. *Lamprotornis zelandicus* Quoy and Gaimard, 1830, Tasman Bay, New Zealand; error = Vanikoro Island. Genus name sometimes given as *Aplornis* (see page 659). Three subspecies recognized.
Subspecies and Distribution.
A. z. maxwellii H. O. Forbes, 1900 – Nendo (Santa Cruz), in WC Santa Cruz Is.
A. z. zelandica (Quoy & Gaimard, 1830) – Vanikoro, in S Santa Cruz Is.
A. z. rufipennis E. L. Layard, 1881 – Banks Is and N & C Vanuatu (S to Efaté).



Descriptive notes. 19 cm. Rather small, dull-plumaged starling. Male nominate race has forehead, crown and nape dark brown with paler, olive edges; mantle and back brown, greenish gloss on back in fresh plumage, rump and uppertail-coverts tawny; wing dark brown, chestnut patch formed by outer webs of secondaries and eight inner primaries; tail brown; chin, throat, breast, belly and vent buffy grey-brown, flanks and undertail-coverts more chestnut in colour; iris pale brown; bill black; legs light brown. Female is similar to male, but smaller and paler. Juvenile undescribed. Race *rufipennis* is larger than nominate, plumage more buffy, with paler chestnut wing patch, rusty flanks and orange undertail-coverts; *maxwellii* is similar to previous, but browner below, with rufous undertail-coverts, also bill heavier and dark brown. VOICE. Most common call a short, melodious "zee-twee"; also repeated metallic whistles. Song short irregular phrases of clicks and metallic whistles.
Habitat. Forest; also secondary growth and partly cleared areas, including wooded gardens. On mountainous islands found primarily in montane forest.
Food and Feeding. Diet primarily fruit; also gleans insects from foliage. Forages mostly in lower canopy, sometimes lower. Generally singly or in pairs.
Breeding. Reported as nesting in tree hole high above ground. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Restricted-range species: present in Vanuatu and Temotu EBA. Poorly known species. Generally uncommon to scarce. Lowland and hill forests in this species' range potentially at risk from logging.
Bibliography. Anon. (2008b), Bregulla (1992), Butchart & Stattersfield (2004), Dutson (2008b), Feare & Craig (1998), Mayr (1942), Stattersfield & Capper (2000).

30. Striated Starling

Aplonis striata

French: Stourne calédonien **German**: Dickschnabelstar **Spanish**: Estornino de Nueva Caledonia

Taxonomy. *Coracias striata* J. F. Gmelin, 1788, New Caledonia.
Genus name sometimes given as *Aplornis* (see page 659). Two subspecies recognized.
Subspecies and Distribution.
A. s. striata (J. F. Gmelin, 1788) – New Caledonia.
A. s. atronitens G. R. Gray, 1859 – Loyalty Is.



Descriptive notes. 18 cm; 49·5–60 g. Rather small blackish starling with short square-ended tail. Male nominate race has forehead and crown blackish, glossed violet and green; mantle, back and rump blackish-brown, feathers tipped with turquoise-green; flight-feathers and tail dark brown, outer webs of feathers slightly glossy; chin and throat feathers have green iridescence, breast and belly feathers tipped turquoise-green, lower belly and undertail-coverts matt black; iris orange-reddish; bill black; legs metallic blue. Female is smaller than male, with plumage uniformly mousy grey-brown, slightly paler below, iris reddish. Immature is similar to female. Race *atronitens* is larger and heavier-billed than nominate, male with greenish iridescence on head. Voice. Noisy. Loud clear thin whistles, e.g. "zhe" or "clee", often sharper and more metallic in flight; clear "chew-wee". Rushed warbling song with clear clicks, squeaks and fluid warbles.
Habitat. Forested areas, including forest edge and clearings, and savanna and gardens; also nearby coconut (*Cocos nucifera*) plantations and second growth; also in villages.
Food and Feeding. Reported food includes papaya (*Carica papaya*), small wild tomatoes (*Solanum lycopersicum*), peppers (*Capsicum*), berries, also insects; and land snails (Gastropoda), shells of which are broken by being hammered against an "anvil".
Breeding. Reported as nesting from Dec to Jan, building platform of twigs and leaves inside hole 1·5–25 m (average 10·5 m) above ground in hollow tree. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in New Caledonia EBA. Common and widespread within its tiny global range.
Bibliography. Barré & Dutson (2000), Barré *et al.* (2006), Doughty *et al.* (1999), Feare & Craig (1998), Finsch (1876a), Hannecart & Létocart (1983).

31. **Mountain Starling**

Aplonis santovestris

French: Stourne d'Espiritu Santo **German**: Rostbürzelstar **Spanish**: Estornino de Espíritu Santo
Other common names: Santo Starling

Taxonomy. *Aplonis santovestris* Harrisson and A. J. Marshall, 1937, Mount Watiamasan, Espiritu Santo, Vanuatu.
Genus name sometimes given as *Aplornis* (see page 659). Monotypic.
Distribution. Island of Espiritu Santo, in N Vanuatu.



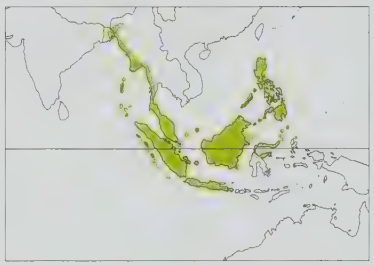
Descriptive notes. 18 cm. Male has forehead and crown dark brown, slight gloss on crown; upperparts, including upperwing-coverts, dark rusty brown, brighter on rump; primaries and secondaries dark brown with rusty outer webs; tail dark brown, rusty-brown margins on outer webs; throat brownish, underparts chestnut-brown; iris whitish; bill brownish-black, paler tip; legs light brown to flesh-coloured. Female is very like male, but has duller rufous plumage. Juvenile undescribed. Voice. Calls described include a hissing note and a harsh call; also "tzee-tzee-tzee" given from perch and in flight, apparently as contact call.
Habitat. Cloudforest above 1200 m.
Food and Feeding. Diet includes fruit, seeds and insects. Forages generally in understorey, below 6 m. Usually seen singly or in pairs.
Breeding. Reported as nesting in hole relatively low down in tree; clutch of 2 whitish eggs reported. No other published information.
Movements. Resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in Vanuatu and Temotu EBA. Poorly known. Local people described the species as widespread in W mountains; in contrast, rarely encountered by visiting ornithologists, and known from very few localities. Recorded from three of the highest mountains (Mt Watiamasan, Mt Tabwemasana and Peak Santo) in, respectively, 1934, 1961 and 1991. No more than one pair has ever been seen, and several observers have failed to find the species. Introduced cats, dogs and rats (*Rattus*) now widespread.
Bibliography. Anon. (2008b), Bregulla (1992), Butchart & Stattersfield (2004), Collar *et al.* (1994), Feare & Craig (1998), Johannsen (1991), Reside (1991), Stattersfield & Capper (2000).

32. **Asian Glossy Starling**

Aplonis panayensis

French: Stourne bronzé **German**: Malaienstar **Spanish**: Estornino Bronceado
Other common names: Philippine (Glossy) Starling (*panayensis*); Indonesian Tree Starling (Indonesian races); Bornean Starling (*eustathis* and *alipodis*)

Taxonomy. *Muscicapa (panayensis)* Scopoli, 1786, nova Guiana; error = Philippines.
Genus name sometimes given as *Aplornis* (see page 659). Many races defined primarily according to size differences based on small samples, and require reassessment; some doubtfully distinct, e.g. *leptorrhyncha* perhaps better merged with *pachistorhina*. Fourteen subspecies currently recognized.
Subspecies and Distribution.
A. p. affinis (Blyth, 1846) – NE India (S Assam), Bangladesh and SW Myanmar.
A. p. tytleri (Hume, 1873) – Coco Is (off S Myanmar), Andaman Is, and N Nicobars (Car Nicobar).
A. p. albiris Abdulali, 1967 – C & S Nicobars.
A. p. strigata (Horsfield, 1821) – S Myanmar (Tenasserim), S Thailand, Peninsular Malaysia, Singapore, Sumatra (including most satellites), Java and W Borneo.
A. p. altirostris (Salvadori, 1887) – Simeluë, Banyak Is and Nias I (off NW Sumatra).
A. p. leptorrhyncha Stresemann, 1913 – Pini I, in N Batu Is (off W Sumatra).
A. p. pachistorhina (Oberholser, 1912) – Batu Is (except Pini) and Mentawai Is (off W Sumatra).
A. p. enganensis (Salvadori, 1892) – Enggano I, off SW Sumatra.
A. p. heterochlora (Oberholser, 1917) – Anamba Is and Natuna Is, between Malay Peninsula and Borneo.
A. p. panayensis (Scopoli, 1786) – Philippine Is and N Sulawesi.
A. p. sanghirensis (Salvadori, 1876) – Talaud Is and islands of Sangihe, Siau, Ruang, Tahulandang and Biaro (off NE tip of Sulawesi).
A. p. eustathis (Oberholser, 1926) – E Borneo.
A. p. alipodis (Oberholser, 1926) – Panjang, Maratau and Derawan, off E Borneo.
A. p. gusti Stresemann, 1913 – Bali.



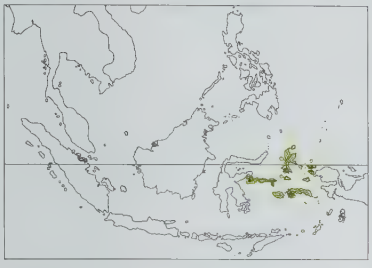
Descriptive notes. 20 cm; 50–60·5 g. Medium-sized starling with forehead feathers bristly and throat feathers lanceolate. Nominate race is black with greenish to oily gloss except on lowermost underparts, which are matt black; small black mask on lores and around eye; iris red; bill and legs black. Sexes alike. Juvenile is initially dark chocolate-brown above, with some green gloss on wings, whitish below with dark feather shafts, appearing heavily streaked, iris yellow, orange or pink; gloss develops progressively, and iris changes gradually to red. Race *sanghirensis* has more massive bill than nominate, and long frontal feathers form short crest; *alipodis* is duller and larger than nominate; *affinis* has stronger green gloss than nominate, crimson iris; *tytleri* is larger, darker and less glossy than previous, with gloss more bluish and iris often brown, though variable (reported also as pink and orange); *albiris* resembles last but has whitish iris; *strigata* is smaller than nominate with plumage showing a rather bluish- to blackish-green tinge on upperparts and more greenish gloss on underparts; *altirostris* differs from previous in having much heavier and distinctively arched bill, and duller plumage with less pure green, more purplish-bronze gloss; *leptorrhyncha* has very slender bill and pure blue gloss on plumage; *pachistorhina* is slightly larger than previous two races with larger, coarser bill, green gloss on plumage and less lanceolated feathers on neck; *heterochlora* is like *strigata* but much larger, heavier-billed, with plumage of adult more bronzy or oily green, but appears more grassy green than nominate; *eustathis* is extremely similar to *strigata*, but overall smaller; *enganensis* also similar to *strigata* but larger with longer wings and stronger bill, immature plumage apparently also different; *gusti* is small with short, weak bill, dorsal gloss much bluer, especially towards rear, and head feathers less elongated and lanceolated than in the adjacent Javanese population. Voice. Calls have a metallic quality; repeated "tsuu tsuu" call, also shrill "tseeu" and "tieuu" whistles, and descending "tseeeer"; high-pitched trill also given (e.g. at roost); flocks noisy. No reports of a vocalization corresponding to song.
Habitat. Forest, forest edge and clearings, secondary growth, mangroves and coastal vegetation, also gardens and coconut (*Cocos nucifera*) plantations; lowlands, generally below 700 m. Sometimes enters urban areas to roost, e.g. in Singapore. Communal roosts may contain up to 15,000 birds; roosts in association with *Acridotheres tristis* and *Acridotheres javanicus*.
Food and Feeding. Diet mainly fruit; also nectar, insects, spiders (Araneae), and snails (*Hemiplecta*). Fruits recorded in diet include, among others, *Ficus fistulosa*, *Ficus grossalaroides*, *Pipturus argenteus*, *Homalanthus populnesu*, *Morinda citrifolia*, *Scaevola taccada*, *Tinospora glabra*, *Leucosyke capitellata*, *Cayratia trifolia*, *Dysoxlylum guadichaudianum*, *Endospermum malaccense*, *Fagraea fragrans*, *Eugenia polyanthus* and *Compnospermum auriculatum*; also exotic *Ptychosperma macarthurii*, nuts of *Caryota mitis*, arils of *Acacia auriculiformis*. Nectar taken from flowering trees of *Bombax* and *Erythrina*. Insects consumed include adult and larval beetles (of family Carabidae), caterpillars (Lepidoptera), mole-crickets (Gryllotalpidae), immature grasshoppers (Orthoptera). Mainly arboreal, foraging often in tops of trees; will eat fallen fruit on ground, and often descends to ground to capture insects; in Malay Peninsula seen to feed on large snails on ground, smashing them against hard objects to break the shells. Hawks alate termites (Isoptera) in air. Highly gregarious, feeding in flocks.
Breeding. Breeds Feb–Apr in NE India, Apr in Andamans and Nicobars, Mar–Jun in Myanmar, Jan–Aug in Peninsular Malaysia, Jan–Jun in Java and Bali, mainly Jun–Sept (some Jan–Oct) in Borneo, and Feb–Jun in Philippines. Presumed monogamous. Sometimes colonial breeder. Nest a rough cup of roots, grass and leaves, placed in natural cavity or old woodpecker (Picidae) hole in living or dead tree, in crown of palm tree, or in hole in cliff or bank, including hole excavated by kingfisher (Alcedinidae), sometimes in hollow in wall, under house eaves or in nestbox; occasionally among epiphytes on large tree. Clutch 3 eggs, blue or blue-green with brown spots; no information on incubation and nestling periods. Ringed individuals survived for at least 7 years.
Movements. Chiefly resident, with some local movements. Apparently a partial migrant in NE Indian Subcontinent, some leaving area after breeding. Some local movement can be extended and involve sea crossings. In Philippines, described as a "wanderer that borders on migratory"; on some islands a breeding visitor only. Dispersal may be over relatively long distances, and movement then sometimes nocturnal.
Status and Conservation. Not globally threatened. Widespread, and common to locally very common throughout most of extensive range. Despite hunting and trapping for food in Philippines, still common through most of the archipelago. Potentially an important agent in the dispersal of seeds of some trees; on the other hand, is common enough to be a pest of crops such as pepper in some areas. Recorded as a rare exotic escapee (race unknown) in Taiwan; breeding there unconfirmed.
Bibliography. Abdulali (1967), Ali & Ripley (1972), Amadon (1956), Blasius (1888, 1897), Choudhary (2004), Coates & Bishop (1997), Corlett & Lucas (1989), Delacour & Mayr (1946), Dickinson *et al.* (1991), Hails (1987), Hoogerwerf (1965a), Hoogerwerf & Rengers Hora Siccama (1938), Kang Nee (1989), Kennedy *et al.* (2000), Lin Rueyshing (2001), MacKinnon & Phillipps (1993), van Marle & Voous (1988), McClure (1998), Medway & Wells (1976), Mees (1986), Oberholser (1917b, 1919a, 1919b, 1932), Peh & Chong Fong Lin (2003), duPont (1971), Rand & Rabor (1960), Rasmussen & Anderton (2005b), Rensch (1930), Riley (1929), Robson (2000), Smythies (1960, 1986), Smythies & Davison (1999), Vorderman (1898a), Wells (2007), White & Bruce (1986), Whittaker & Jones (1994).

33. **Moluccan Starling**

Aplonis mysolensis

French: Stourne des Moluques **German**: Molukkenstar **Spanish**: Estornino Moluqueño
Other common names: Island Starling

Taxonomy. *Calornis mysolensis* G. R. Gray, 1862, Misool, West Papuan Islands.
Genus name sometimes given as *Aplornis* (see page 659). Geographical variation trivial; birds from from Banggai Is described as race *persimilis*, those from Sula Is as *sulaensis*, and those from Halmahera as *forsteni*, but all considered inseparable from birds of this species elsewhere in range. Treated as monotypic.
Distribution. Banggai Is and Sula Is, off E Sulawesi; Morotai, Halmahera, Ternate, Bacan, Obi, Buru, Seram, Ambon, Haruku and Saparua, in Moluccas; and West Papuan Is (Gebe, Ajoe, Waigeo, Batanta, Salawati, Misool, and some smaller islets).



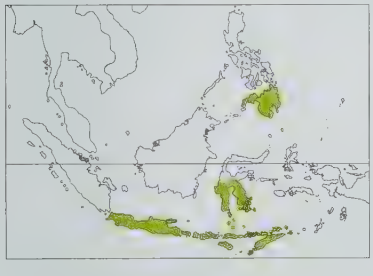
Descriptive notes. 20 cm. Medium-sized starling with fairly long, strongly graduated tail (central feather pair longest), bristly feathers on forehead, and lanceolate but not elongated feathers on neck and throat. Plumage is mostly black, glossed with green-purple; wings and tail duller; iris brown; bill and legs black. Sexes alike. Juvenile is shorter-tailed than adult, chocolate-brown above, feathers of underparts chocolate-brown with pale margins, producing heavily streaked appearance. Voice. High-pitched "teeck" calls during foraging; short "sqweow sqweow" in flight; also a wide variety of nasal whistles, chattering and squealing notes, as well as piercing, upward-inflected notes.
Habitat. Ranges from mangroves and coastal woodland to lowland forest, and to hill forest above 1000 m; also in degraded forest, cultivated areas, scrub, and trees in settlements and some towns.
Food and Feeding. Fruit; probably also insects and nectar. Noted in figs (*Ficus*), casuarinas (*Casuarina*) and flowering sago palms (*Metroxylon*). Forages generally in flocks, occasionally in pairs or singles, high in trees; may form mixed flocks with *A. metallica*.
Breeding. No information on season. Presumed monogamous. Colonial nester; colonies contain up to 50 individuals, occasionally more (up to 200 recorded). Nest in tree hole; said to excavate own hole in dead wood. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Fairly common in most of range; common on some islands; scarcer on Buru. Apparently tolerant of altered habitats.
Bibliography. Coates & Bishop (1997), Feare & Craig (1998), Jepson (1993), Rand & Gilliard (1967), Stresemann (1914), Vorderman (1898b), White & Bruce (1986).

34. Short-tailed Starling

Aplonis minor

French: Stourne à queue courte **German**: Sundastar **Spanish**: Estornino Colicorto
Other common names: Lesser/Short-tailed Glossy Starling

Taxonomy. *L[amprotornis] minor* Bonaparte, 1850, Timor.
Genus name sometimes given as *Aplornis* (see page 659). Birds from Mindanao sometimes separated as race *todayensis*; further study required. Treated as monotypic.
Distribution. S Philippines (Mindanao), C & S Sulawesi (and islands of S coasts), islands in Flores Sea (Tanahjampea, Kayuadi, Kaleo, Kaleotoa), Java, Bali and Lesser Sundas (E to Roma and Moa).



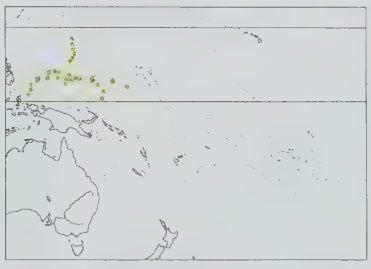
Descriptive notes. 18 cm; 39–45 g. Small starling with short tail. Plumage mostly blackish, head and neck iridescent bronzy purple, with brighter purple on nape, side of neck, throat and breast; body iridescent oily green; wing black, some green gloss on secondaries, tail black, with green gloss on outer rectrices; iris vermilion; bill and legs black. Sexes alike. Juvenile dark brown above, some green gloss on crown and back, brown below, paler on throat and belly, with paler margins of feathers producing streaked look. Voice. Plaintive "seep" as contact call; clear metallic shriek, "teek teek", in flight; short chattering notes and slurred, metallic "chilanc".
Habitat. Forest and forest edge; rarely in cultivated areas and villages in most of range, but in Java and Bali apparently favours cultivated areas close to forest. Generally in lowlands, below 1500 m; on Mindanao found in mountain forest above 900 m.
Food and Feeding. Fruit and berries, also insects; coffee (*Coffea*) berries reported as eaten. Forages both in forest canopy and at edge. Gregarious; forages in small flocks, forms communal roosts.
Breeding. Few data. Birds with enlarged gonads in Apr on Mindanao. Said to nest in tree holes in small colonies; other accounts imply that this species nests solitarily and excavates own hole in dead tree. Eggs reportedly blue-green with fine brown speckling.
Movements. Mostly resident. On some islands apparently present only seasonally, and may be nomadic or migratory; according to some authors, a non-breeding migrant in Java and Bali.
Status and Conservation. Not globally threatened. Widely distributed and locally common. Uncommon to locally moderately common in Wallacea.
Bibliography. Amadon (1956), Coates & Bishop (1997), Dickinson *et al.* (1991), Feare & Craig (1998), Kennedy *et al.* (2000), MacKinnon (1988), MacKinnon & Phillipps (1993), Meise (1929), Meyer (1884), duPont (1971), Rensch (1930, 1931), Trainor & Soares (2004), Vorderman (1895), White & Bruce (1986).

35. Micronesian Starling

Aplonis opaca

French: Stourne de Micronésie **German**: Karolinenstar **Spanish**: Estornino de Micronesia

Taxonomy. *Lamproth.* [*ornis*] *opaca* Kittlitz, 1833, Kosrae, Caroline Islands.
Genus name sometimes given as *Aplornis* (see page 659). Seven subspecies recognized.
Subspecies and Distribution.
A. o. aenea Takatsukasa & Yamashina, 1931 – N Northern Mariana Is (Asuncion, Agrihan, Pagan, Alamagan).
A. o. guami Momiyama, 1922 – S Northern Marianas (Saipan, Tinian, Rota, Guam).
A. o. orii Takatsukasa & Yamashina, 1931 – Palau Is (Kayangel, Babelthuap, Koror, Garakayo, Ngesebus, Peleliu, Ngabad, Angaur).
A. o. kurodai Momiyama, 1920 – Yap, in extreme W Caroline Is.
A. o. anga Momiyama, 1922 – Caroline Is (Ulithi, Fais, Faraulep, Woleai, Ifalik, Lamotrek, Chuuk, Lukunor, Nukuoro).
A. o. ponapensis Takatsukasa & Yamashina, 1931 – Pohnpei (including Kapingamarangi Atoll, 740 km SW of main island), in E Carolines.
A. o. opaca (Kittlitz, 1833) – Kosrae, in extreme E Carolines.



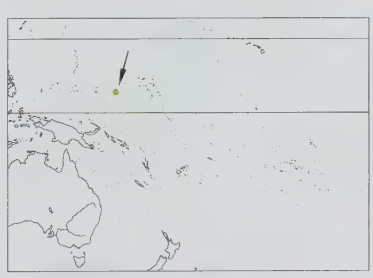
Descriptive notes. 24 cm; 71–93 g. Rather large starling with short tail. Nominate race is entirely black, with slight green iridescence on head, mantle, back and wing-coverts; iris yellow; bill and legs black. Sexes similar, female slightly smaller and duller than male. Juvenile has crown to rump, wings and tail dark brown without gloss, throat and breast dark brown with pale buff feather margins, producing heavily streaked appearance, broader pale margins on belly feathers; iris yellow from an early stage, bill initially horn-coloured at base. Races differ mainly in bill size and colour of gloss: *ponapensis* is larger than nominate, with longer bill, richer green iridescence; *anga* also is larger, with marked greenish iridescence both above and below; *kurodai* has heavier bill, bronzy-green gloss on plumage; *aenea* has smaller bill, bronze gloss; *guami* has shorter bill, green iridescence on entire plumage; *orii* is larger than nominate, with longer and more slender bill. Voice. Song, delivered from high perch, a melodious ascending phrase consisting of modified call notes. Calls varied, including whistles and gurgling notes, sometimes in chorus with other individuals, and a chipping call in flight; typical call described as harsh rolling "brleeep".
Habitat. Forest and disturbed areas, from coastal scrub to dense coconut (*Cocos*) forest, from sea-level to tops of mountains. Occurs in settlements, as well as on islands which are seldom visited by humans.
Food and Feeding. Diet primarily fruits and seeds; also insects, and eggs of seabirds; sometimes described as omnivorous. Fruits taken include those of figs (*Ficus*), papaya (*Carica papaya*) and *Pithecellobium dulce*. Insects found in stomach contents were a wasp (Hymenoptera), a grasshopper (Orthoptera) and unidentified larvae. Eggs of Black Noddy (*Anous minutus*) and Red-footed Booby (*Sula sula*) taken; may take advantage of human disturbance in seabird colonies to attack eggs. Otherwise, forages primarily in trees, both in understorey and in canopy. Often in flocks, generally of up to twelve individuals.
Breeding. Breeds in all months on Guam, in Aug on Yap and Pohnpei, and in Oct–Dec on Chuuk. Monogamous. Nest built from sticks, lined with grass and leaves, placed in cavity 4–15 m above ground in tree, palm or tree-fern, or sometimes in cliff or in rotting pole or other man-made structure. Clutch 1–4 eggs, generally 2, pale green or greenish-blue, spotted with black, brown, russet and purple, concentrated at thick end; incubation by both sexes, no information on duration; chicks fed by both parents, both also remove faecal sacs, nestling period 21–25 days; independent young join flocks of other juveniles.
Movements. Resident; populations tend to be distinct from those on other islands in same region, suggesting that little or no interchange occurs.
Status and Conservation. Not globally threatened. Restricted-range species: present in Mariana Islands EBA, in Palau EBA, in Yap Islands EBA and in East Caroline Islands EBA. Common in most of range. Found in varied habitats on even small islets; density on Kapingamarangi Atoll (Pohnpei) estimated at 5·7 birds/ha. Population on Guam devastated following introduction of brown tree-snake (*Boiga irregularis*), a major nest predator, which was established throughout the island by 1968; latest assessments indicate that it has lost more than 90% of its population since roadside surveys began, in 1974, and no signs of any recovery by 1998; this is, however, the only native passerine surviving on Guam, perhaps because it sometimes nests in buildings which are relatively clear of snakes. Collected for food on some islands.
Bibliography. Amadon (1956), Baker (1951), Brandt (1962), Buden (1998), Craig, R.J. (1996), Finsch (1876a), Fisher (1950), Jenkins (1983), Reichel & Glass (1990), Wiles *et al.* (2003).

36. Pohnpei Starling

Aplonis pelzelni

French: Stourne de Ponapé **German**: Pelzelnstar **Spanish**: Estornino de Ponapé
Other common names: Pohnpei Mountain Starling

Taxonomy. *Aplonis pelzelni* Finsch, 1876, Pohnpei, Caroline Islands.
Genus name sometimes given as *Aplornis* (see page 659). Monotypic.
Distribution. Pohnpei, in E Caroline Is.



Descriptive notes. 16 cm. Small dull starling lacking iridescence in plumage. Head and upperparts are sooty brown, paler brown on rump and uppertail-coverts; wing and tail also pale brown; throat and underparts pale brown, washed with olive-brown; iris brown; bill and legs black. Sexes alike. Juvenile is similar to adult but lighter brown, particularly on underparts. Voice. Call described as a shrill "see-ay" with bell-like quality.
Habitat. Forest in mountains, above c. 500 m; formerly more widespread and extending to lowlands.
Food and Feeding. Diet mainly fruits, also seeds and insects. Berries taken from shrubs; some insect food and seeds collected on ground. Normally forages in pairs.
Breeding. Female in breeding condition in Jul. Said to nest in tree hole and to lay 2 eggs; confirmation required. No other information.
Movements. Resident.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in East Caroline Islands EBA. This species was not found in a survey in 1983 and was thought to be extinct, until a specimen was obtained in 1995; also several unconfirmed reports. Has declined drastically; in 1930, over a three-month period, 60 specimens were collected. Habitat loss, hunting and possible predation by rats (*Rattus*) may account for decline.
Bibliography. Anon. (2008b), Baker (1951), Buden (1996), Butchart & Stattersfield (2004), Collar *et al.* (1994), Engbring *et al.* (1990), Feare & Craig (1998), Finsch (1876a), Stattersfield & Capper (2000).

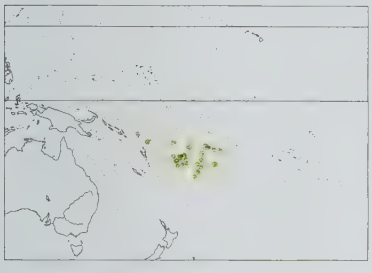

ssp tahuensis
ssp brevirostris
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37
ssp rotumae
ssp manuae
ssp vulgaris
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ssp porphyronotus
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ssp superciliaris
ssp contra
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PLATE 42
inches 4
cm 10

37. **Polynesian Starling**

Aplonis tabuensis

French: Stourne de Polynésie **German**: Südseestar **Spanish**: Estornino de Polinesia
Other common names: Striped Starling

Taxonomy. *Lanius tabuensis* J. F. Gmelin, 1788, Friendly Islands = Tonga Islands.
Genus name sometimes given as *Aplornis* (see page 659). Twelve subspecies recognized.
Subspecies and Distribution.
A. t. pachyrampha Mayr, 1942 – Tinakula Group and Swallow Is, in Santa Cruz Is.
A t. tucopiae Mayr, 1942 – Tikopia, in SE Santa Cruz Is.
A. t. rotumae Mayr, 1942 – Rotuma I (N of Fiji).
A. t. fortunae E. L. Layard, 1876 – Wallis and Futuna Is (Horne Is).
A. t. brevirostris (Peale, 1848) – Samoa.
A. t. tutuilae Mayr, 1942 – Tutuila I, in American Samoa.
A. t. manuae Mayr, 1942 – Manua Is, in American Samoa.
A. t. vitiensis E. L. Layard, 1876 – Fiji (except E).
A. t. nesiotes Mayr, 1942 – Niuafo'ou, in N Tonga.
A. t. tenebrosa Mayr, 1942 – Tafahi and Niuatoputapu, in N Tonga.
A. t. tabuensis (J. F. Gmelin 1788) – Lau Archipelago (E Fiji) and S Tonga Is.
A. t. brunnescens Sharpe, 1890 – Niue, E of Tonga.



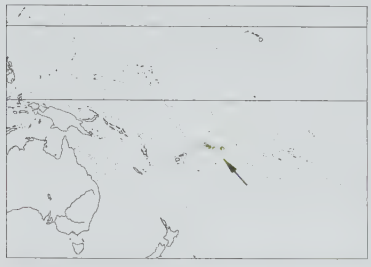
Descriptive notes. 20 cm; 52–69 g. Medium-sized, stocky, rather short-tailed starling with relatively short bill and brown or brownish plumage. Nominate race is brown above, darker and with violet iridescence on forehead and crown; wing dark brown, paler margins on outer webs of secondaries (producing pale patch on closed wing); tail brown; paler buffy brown below, white feather shafts on throat and breast producing slight streaked effect; iris red-brown; bill dark horn-brown; legs dark brown. Sexes alike. Juvenile apparently undescribed. Race *brunnescens* has smaller, thinner bill than nominate, no iridescence on crown, iris red-brown or dark brown; *tenebrosa* is uniformly dark sooty brown, upperparts glossed greenish, underparts with buffy shaft streaks; *nesiotes* is darker than nominate (but not so dark as previous), and iris is yellow; *pachyrampha* has dark brown underparts, shaft streaks only on lower breast and flanks, iris brown; *tucopiae* is uniformly brown without streaking on underparts, gloss restricted to crown, iris brown or yellowish; *rotumae* duller than nominate, most of plumage with olivaceous tinge, has broad greyish margins on back and rump feathers, more white on lower belly, more slender and less curved bill, iris yellow; *fortunae* is somewhat smaller than nominate, with browner back and paler, more streaked underparts, iris yellow; *brevirostris* is smaller and darker than nominate, but with prominent streaking below, pale wing patch, stubby pale brown bill, iris yellow; *tutuilae* is larger than previous, with darker underparts, more distinct light shaft streaks and large bill, iris yellow; *manuae* has darker back than last, no wing patch, dark grey-brown underparts without streaks, small bill, iris yellow; *vitiensis* has thinner bill than nominate, more pronounced streaking on underparts, paler wing patch, iris colour varies from brown on N & W islands to yellow elsewhere in range. Voice. Dry buzzing rattle; advertising call a high-pitched double whistle, "twee-wee", repeated frequently; other whistles recorded, and a hissing call. Complex whisper song with mimicry.
Habitat. On smaller islands exploits all habitats, including highly disturbed areas such as regenerating scrub and coconut (*Cocos nucifera*) plantations; on larger islands primarily in forest, also in well-wooded secondary habitats. On islands where *A. atrifusca* occurs, present species found mainly in high forest.
Food and Feeding. Diet mainly fruit, also insects gleaned from foliage. On Niuafo'ou I (N Tonga), took fruit of *Morinda citrifolia*, *Cassytha filiformis*, *Scaevola frutescens* and *Premna taitensis*. Forages at all levels, from low scrub to high canopy, in active and often acrobatic fashion; observed clinging to tree trunks, supported by the tail in woodpecker (Picidae) style, while probing crevices in bark. Generally seen in small flocks, occasionally singly.
Breeding. Mar–Aug/Sept in Samoa; recorded in Aug on Niue. Nest built from dry vegetable fibres, at variable height in tree hole or broken stump of coconut palm; clutch 2–3 eggs, blue with brown and red-brown spots and blotches. No other information.
Movements. Apparently resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Vanuatu and Temotu EBA, in Fiji EBA, in Samoan Islands EBA, in Rotuma Secondary Area, in Wallis and Futuna Secondary Area, in Niuafo'ou Secondary Area, in Tonga Secondary Area and in Niue Secondary Area. Widely distributed over several groups of small islands; considered to be common on many of the islands in its range.
Bibliography. Beichle & Baumann (2003), Bellingham & Davis (1988), David & Gosselin (2002b), Kinsky & Yaldwyn (1981), Mayr (1942), Muse & Muse (1982), du Pont (1976), Rinke (1986, 1987), Watling (1982).

38. **Samoan Starling**

Aplonis atrifusca

French: Stourne de Samoa **German**: Samoastar **Spanish**: Estornino de Samoa

Taxonomy. *Lamprotornis atrifusca* Peale, 1848, Upolu, Samoa.
Genus name sometimes given as *Aplornis* (see page 659). Monotypic.
Distribution. Samoan Is, occurring in Samoa (Savai'i and Upolu) and American Samoa (Tutuila, Ofu, Olosega and Tau).
Descriptive notes. 30 cm; 125–158 g. Large starling with longish square-ended tail and strong bill. Forehead, crown and nape are dark brown with violet-green iridescence, mantle brown with greenish iridescence (on feather tips); rump, wing and tail sepia-brown, rufous tinge on outer webs of primaries forming indistinct panel; chin to upper breast blackish-brown with violet-green iridescence, belly medium brown with greenish iridescence; iris dark brown; bill and legs black. Sexes alike. Juvenile described as dull brown. Voice. Calls monosyllabic, include harsh screech and softer whistles, also rasping and squeaking notes. Loud wing noise in flight.



Habitat. Primarily coastal vegetation and plantations, also lower forests, especially when partially logged, and cultivations; least common in higher-lying forest, but occurs at all elevations. Commonly found around villages and towns.
Food and Feeding. Diet mainly fruit, especially guavas (*Psidium*), bananas (*Musa*) and papayas (*Carica papaya*); also invertebrates. Seen to probe flowers of *Erythrina*, presumably for nectar (has brush-like tongue). Forages mostly in tops of trees; in small flocks, also singly.
Breeding. Season probably at least Mar–Jul. Nest in hole in tree, one 10 m up in hole in top of coconut palm (*Cocos nucifera*). Eggs reported as pale blue. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Samoan Islands EBA. Common. Numbers on Tutuila fell by c. 66% in early 1990s following a hurricane. Considered an aggressive species towards introduced competitors. Sometimes considered an agricultural pest. In contrast, is an important pollinator of some Samoan plants, such as the liana *Freycinetia reineckei*. Exploited for food on some islands.
Bibliography. Beichle & Baumann (2003), Bellingham & Davis (1988), Cox (1982), Craig *et al.* (1994), Dhondt (1976), Evans, S.M. *et al.* (1992), Mayr (1942), Muse & Muse (1982), Watling (1982).

39. **Rarotonga Starling**

Aplonis cinerascens

French: Stourne de Rarotonga **German**: Rarotongastar **Spanish**: Estornino de Rarotonga

Taxonomy. *Aplonis cinerascens* Hartlaub and Finsch, 1871, Rarotonga.
Genus name sometimes given as *Aplornis* (see page 659). Monotypic.
Distribution. Rarotonga I, in S Cook Is.



Descriptive notes. 21 cm; 77–88 g. Medium-sized, greyish-brown starling. Forehead and crown are mousy brown with faint purple iridescence; mantle, back and rump mouse-brown, edged with grey; wing and tail dull brown, paler edges on inner secondaries; chin, throat, breast and upper belly mouse-brown, broad paler tips on breast and belly, lower belly and undertail-coverts whitish; iris pale yellow, sometimes dark brown with narrow yellow outer ring; bill and legs black. Sexes alike. Juvenile undescribed. Voice. Song sweet, described as the most melodious of any Rarotonga bird species. Calls include whistles, squeaks and bell-like notes.
Habitat. Undisturbed montane forest, also disturbed fringing forest, in rugged interior from 150 m to highest point of island (600 m). Sometimes lower, down to as low as 30 m, but much rarer in coastal areas than was previously the case.
Food and Feeding. Diet includes fruit and insects, also nectar. Feeds on fruit in canopy, also at flowers; gleans insects from foliage. Forages singly and in pairs.
Breeding. Season Aug–Dec. Nest a lining of dead leaves and plant fibres in tree hole 4–6 m above ground, with apparent preference for native trees (e.g. *Bischofia javanica*, *Homalium acuminatum* and *Hernandia moerenhoutiana*); nest-hole reused in subsequent years. Clutch at least 2 eggs. No other information.
Movements. Resident.
Status and Conservation. VULNERABLE. Restricted-range species: present in Southern Cook Islands EBA. Population currently thought to be stable. Considered abundant in 1904, and population of several thousands estimated in 1973, but by 1984 no more than c. 100 individuals; the most recent estimates are of c. 500 birds. Habitat destruction and introduced rats (*Rattus*) believed to be the main threats. Seems to have disappeared from lowlands in 1970s, possibly owing to aggressive competition from introduced *Acridotheres tristis*, which apparently has not penetrated forested uplands.
Bibliography. Anon. (2008b), Butchart & Stattersfield (2004), Collar & Andrew (1988), Collar *et al.* (1994), Feare & Craig (1998), Holyoak & Thibault (1984), Mayr (1942), McCormack (1997), Stattersfield & Capper (2000).

Genus *STURNUS* Linnaeus, 1758

40. **Common Starling**

Sturnus vulgaris

French: Étourneau sansonnet **German**: Star **Spanish**: Estornino Pinto
Other common names: European/Eurasian/Northern Starling, Purple-winged Starling

Taxonomy. *Sturnus vulgaris* Linnaeus, 1758, Sweden.
Forms a superspecies with *S. unicolor*; formerly considered conspecific, and genetic differentiation only slight, some hybridization occurring in area of breeding overlap in SW Europe. On basis

On following pages: 41. Spotless Starling (*Sturnus unicolor*); 42. Red-billed Starling (*Poliopsar sericeus*); 43. White-cheeked Starling (*Poliopsar cineraceus*); 44. Wattled Starling (*Creatophora cinerea*); 45. Rose-coloured Starling (*Pastor roseus*); 46. Black-collared Starling (*Gracupica nigricollis*); 47. Asian Pied Starling (*Gracupica contra*); 48. Bali Myna (*Leucopsar rothschildi*); 49. Purple-backed Starling (*Agropsar sturninus*); 50. Red-cheeked Starling (*Agropsar philippensis*).

of recent molecular data, coupled with behaviour, may be only distantly related to some of the other species often assigned to present genus. Thirteen subspecies recognized.

Subspecies and Distribution.

S. v. vulgaris Linnaeus, 1758 – breeds from Iceland E to Ural Mts, S to N & NE Spain, S Italy, SE Europe and N Ukraine, also on Canary Is; non-breeding also S throughout Iberia and to N Africa.

S. v. faroensis Feilden, 1872 – Faroe Is.

S. v. zetlandicus E. J. O. Hartert, 1918 – Shetland Is.

S. v. granti E. J. O. Hartert, 1903 – Azores.

S. v. poltaratskyi Finsch, 1878 – breeds E Ural Mts E to L Baikal, S to N & E Kazakhstan, N Kirghiz Steppes and through N Dzungaria to W Mongolia.

S. v. tauricus Buturlin, 1904 – S & E Ukraine and Crimea E to S Russia (Stavropol), and Asia Minor (except E); non-breeding also Middle East.

S. v. caucasicus T. Lorenz, 1887 – Volga Delta, N Caucasus and E Transcaucasia, Azerbaijan, S Caspian Sea region and W & S Iraq.

S. v. purpurascens Gould, 1868 – W Transcaucasia, E Turkey, Georgia and Armenia; non-breeding also Egypt.

S. v. oppenheimi Neumann, 1915 – SE Turkey and N Iraq.

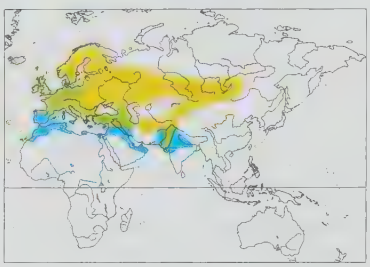
S. v. porphyronotus Sharpe, 1888 – breeds E Kazakhstan and extreme NW China (W Xinjiang) S to E Uzbekistan and Tajikistan; non-breeding N Indian Subcontinent.

S. v. nobilior Hume, 1879 – breeds NE Iran, S Turkmenistan and N Afghanistan; non-breeding NW Indian Subcontinent.

S. v. humii W. E. Brooks, 1876 – breeds W Himalayas (from Kashmir E to Garhwal).

S. v. minor Hume, 1873 – Pakistan (Indus valley).

Introduced (nominate race) in North America, NW Mexico, Caribbean (Jamaica and Puerto Rico), South Africa, Australia, New Zealand; now breeding also in Argentina (Buenos Aires province).



Descriptive notes. 21 cm; 55–100 g. Medium-sized, short-tailed starling with crown and nape feathers lanceolate, throat feathers also lanceolate; plumage mostly blackish, variably glossed. Male nominate race in fresh plumage has prominent pale buff to whitish tips on all body feathers, tending to mask gloss of plumage; head black with purplish-green iridescence; wing and tail brown with very narrow buff margins, some gloss on outer webs; chin and throat blackish with some purple gloss (feathers increasingly lanceolate posteriorly); breast and upper belly dark brown, glossed green, more purple gloss on flanks; lower belly and undertail coverts lack gloss, have broader and whiter tips; iris dark brown; bill black with brown or grey tinge; legs reddish-brown to chestnut-brown. Male in breeding season has lost most pale tips (especially on breast), has strong purple gloss on head and throat, green gloss on mantle, rump and breast, feathers of throat and upper breast elongated (erected in display); bill yellow, basal third steel-blue, legs deep pink. Female is similar to male, with more extensive pale tips of body feathers (tips still evident even after abrasion) and plumage generally less glossy, lanceolate feathers of head and neck shorter and less glossy; iris dark brown, pale ring on either inner or outer margin variable in colour (cream, grey, pale brown, pale yellow); during breeding, bill yellow with paler, pinkish base. Juvenile is medium brown above, wing and tail feathers edged buff, chin whitish, breast buffy white with brown tips, belly feathers pale with dark shafts and tips (producing streaked or blotched appearance), bill brownish-black, yellow gape flanges initially (disappearing with age), legs pinkish-brown; during moult, juvenile very variable in appearance as pale-tipped dark adult feathers appear, head feathers last to be replaced. Races differ mainly in colour and extent of gloss and in size: *faroensis* is larger and heavier than nominate, juvenile much darker; *zetlandicus* is intermediate between previous and nominate; *granti* is very like nominate but slightly smaller and shorter-legged, more extensively purple above; *poltaratskyi* is more purple on head and bluer below than nominate, gloss on wing-coverts greenish-purple; *tauricus* has greenish head, bluish mantle, purplish breast, bronze sheen on belly, flanks, wing-coverts and secondaries; *purpurascens* has coppery head and throat, bluish-green back and rump; *oppenheimi* is glossed green on crown, chin, throat and side of neck, purple on ear-coverts, and purple elsewhere, with green on mantle and bronze tinge on flanks; *caucasicus* has green head and upperparts, purplish-violet belly; *nobilior* similar to previous, but with head more purplish; *porphyronotus* has greenish head sharply demarcated from reddish-purple upperparts and bronzy-purple underparts, and is virtually unspotted in breeding season (but more glossy and colourful than *S. unicolor*); *humii* has head bluish; *minor* is notably smaller than other races. Voice. Male song, heard most of year (but rarely during moult), contains much variation and mimicry; male repertoire size varies with degree of social interaction, largest at large colonies, notably smaller where breeding as isolated pairs; female sings at lower intensity, generally has smaller repertoire and shorter song bouts than male, and singing apparently suppressed during breeding. (Song-learning appears to continue throughout life; males learn from males, females from other females, mimicry of other species direct from models or from other starlings.) Song of two main elements, whistles and warbling, in complex combination, starting with whistles, proceeding through song types including mimicry of other bird species, with rattles and squawks, and ending with high-pitched trills or screams; at roost-sites song probably plays a role in establishing dominance and may help to synchronize activity of individuals. Variety of calls: high-pitched scream in distress; snarl when predator approaches nest (especially when young present); short metallic "chip" on sighting predator, also during descent to a foraging or roosting site; soft "prurrp" on taking flight; harsh, high-intensity call in post-breeding flocks; repeated "chackerchacker" during aggressive encounters or aerial chases. In areas of sympatry with *S. unicolor* in NE Spain, both species share same dialect, and interspecific song-matching is frequent, with similarity of repertoire comparable to intraspecific variation of the two in areas of allopatry.

Habitat. Open country, including modified habitats, with access to suitable nesting and roosting sites; requires cavity nest-sites, typically in woodland or on man-made structures, close to open areas of short grassland for foraging. During non-breeding season exploits wide range of habitats, including moorland, saltmarshes, seashore and tidal flats, stubble fields, orchards, refuse dumps and sewage-treatment works. Roosting sites include reedbeds, scrub and trees, also bridges and buildings, even in town centres; huge winter roosts in Europe may contain more than one million birds, while in Israel reported as reaching 5–8 million; sites offer both protection from predators and favourable microclimate. Availability of invertebrate food crucial throughout annual cycle. Primarily lowlands, to 1500 m in Switzerland and 1850 m in Russia; to 2500 m in Himalayas.

Food and Feeding. Essentially omnivorous, diet including plant and animal material; much regional and seasonal variation, reflecting opportunistic response to environment. Insects taken include soil-dwelling larvae of e.g. craneflies (Tipulidae) and moths (Lepidoptera), also adults of mayflies (Ephemeroptera), dragonflies (Odonata), lacewings (Neuroptera), grasshoppers and crickets (Orthoptera), caddis flies (Trichoptera), flies (Diptera), ants, bees and wasps (Hymenoptera) and beetles (Coleoptera); other invertebrates taken are small crabs (Decapoda), spiders (Araneae), harvestmen (Opiliones), millipedes (Diplopoda), centipedes (Chilopoda), woodlice (Isopoda), earthworms (Oligochaeta) and snails (Gastropoda). Vertebrates such as frogs and newts (Amphibia) and lizards (Reptilia) eaten. Plant foods include berries and seeds of yew (*Taxus baccata*), oak (*Quercus*), apple (*Malus*), pear (*Pyrus*), cherry and plum (*Prunus*), rowan (*Sorbus aucuparia*), elder (*Sambucus*), nightshade (*Solanum*), bryony (*Bryonia*), sea-buckthorn (*Hippophae rhamnoides*), and cultivated plants such as olives (*Olea*), grapes (*Vitis*), sorghum (*Sorghum*) and cereals (wheat, oats, barley, maize, millet); olfactory sense important during foraging, as anthranilate has been used successfully as a repellent on cultivated grain. Nectar taken from flowers, including *Aloe* and *Erythrina* in South Africa (where present species introduced). Also takes kitchen scraps and other human discards of all kinds, and feeds on pellets put out for domestic stock and pets. Highly adapted for open-bill probing in grass; juveniles initially less successful in probing (as diet contains fewer soil invertebrates), and they may forage apart from adults. Prying technique employed also on seashore, in searching for ectoparasites in fur of mammals, and to expose buried cereal grains. Will pursue insects on ground and hawk flying insects. Pulls off fragments of fruit and other large food items. Forages in small to large groups, often in huge flocks in non-breeding season; also singly and in pairs during breeding.

Breeding. Season mainly Mar–Jul, with later start and shorter season in N & E of range; often double-brooded, but usually single brood in N & E; in Southern Hemisphere (introduced) Sept–Dec. Generally monogamous, but polygyny common and some males have as many as five mates (older males more successful in this respect). Solitary nester, but frequently nests clustered in colonies in Europe (introduced populations in Australia, New Zealand and South Africa nest singly); laying in colonies often closely synchronized. In areas of sympatry with *S. unicolor* in NE Spain, mixed colonies frequent, and breeding of both species is synchronized. During courtship, song by male often accompanied by peculiar rotation of half-open wings around shoulder joint. Nest a bulky structure of dry grass, conifer needles, twigs, string and other material, cup lined with softer material such as grass, feathers, moss, wool, hair and paper, fresh green leaves and flowers often placed in cup by male, built in hole in tree, cliff, building or other structure (even a wrecked ship 200 m offshore in South Africa), exceptionally in hole in ground, or nest placed on ground; generally existing cavity used, including hole excavated by other species such as woodpecker (Picidae), but occasionally will dig own hole in sand dune or soft rock; nestboxes readily occupied; competition with other hole-nesting species reported both from native range and where introduced, and sometimes usurps nest of other species; also, shortage of nest-sites can lead to intense intraspecific competition, and fighting can result in death of one of the combatants. Clutch normally 4–6 eggs, clutches laid later in season generally smaller; eggs plain pale blue, sometimes whitish; incubation mostly by female, male taking c. 25% of the duty during daytime, male contribution greater for larger clutches, incubation period 11–14 days (15 days reported in South Africa); chicks fed by both parents, when male polygynous one or more females often left to raise brood unaided, nestling period 21 days; young fed for at least five days after leaving nest. Intraspecific brood parasitism regular at low frequency, and female sometimes removes a host egg when adding her own to a clutch; female will eject eggs appearing in nest up to day when she lays, and male will do so until 3–4 days before. In North America (where present species introduced), nest occasionally parasitized by Brown-headed Cowbird (*Molothrus ater*). Hatching success high, more than 70%, fledging success more variable, 29% to 98% in different studies, with inter-annual variation in long-term studies, and second brood often less successful than first; grey squirrel (*Sciurus carolinensis*) an occasional nest predator, also American red squirrel (*Tamiasciurus hudsonicus*) in North America; in long-term study in S England, large annual differences in percentage of young returning to colony, suggesting inter-annual differences in survival or emigration (few chicks from second broods returned); among introduced populations, average 2·3 fledglings per breeding attempt on Dassen I (South Africa), and predation by introduced stoats (*Mustela erminea*) and black rats (*Rattus rattus*), also Little Owls (*Athene noctua*), significant in some years in New Zealand, where breeding success at five sites was in range 18–61% over 23 seasons. Longevity up to 21 years in the wild.

Movements. Migratory in N & E of range; tends to be resident in S & W, and in some urban regions. Among the earliest migrants returning in spring, reaching breeding areas in Belgium in Feb, Poland and Sweden in Feb–Mar, and even NW Russia (Arkhangel'sk, 65° N) by Apr. Migration primarily N–S in E of range, birds wintering S to N India and W to Afghanistan and Middle East; in W Europe a large component of movement directed to W, birds wintering from British Is S to Iberian Peninsula and N Africa, where present mainly Oct–Mar, and sometimes on Atlantic islands. Recoveries in Tunisia of individuals ringed in E Europe (Poland, Czech Republic, Slovakia, Hungary, former Yugoslavia); one from Italy found in Libya, and one from Russia recovered in Egypt. In non-breeding season, birds will gather from a wide region (radius of more than 50 km, exceptionally up to 120 km) to join communal roosts. Among introduced populations, N breeders in North America have established migratory patterns and some spend non-breeding season in Mexico; sedentary in Southern Hemisphere. Vagrants recorded in many regions of world.

Status and Conservation. Not globally threatened. Common to very common, and locally abundant. Considered one of the most abundant bird species in the world. Recent population declines reported from Britain and many areas of N Europe seem to correlate with intensification and specialization of agriculture and consequent changes in rural habitats; in Britain and Finland declines coincided with reduction in cattle farming, notably closure of dairy farms. Sustained reduction in numbers since 1970 has led to this species being red-listed as regionally endangered in Britain, where it was formerly a pest in many agricultural areas; decline driven by decrease in survival, especially of first-year birds. Concomitant increases in population and expansion of range in S Europe, although expansion in NE Spain apparently slowed in areas of sympatry with *S. unicolor*, the first of these detected around 1977; regional shifts in abundance also in North America (introduced), but on balance the overall population has probably remained stable in both regions. Introduced populations in America now widespread, from EC Alaska E in Canada to Newfoundland, and S throughout USA to NW Mexico Baja California) and Caribbean (established on Jamaica and Puerto Rico); in South America recently established in Argentina, where population increasing (origin of this population uncertain). Introduced populations elsewhere still extending ranges: in South Africa, where apparently introduced in 1897, widespread in W (S of R Orange), and expanding E towards KwaZulu-Natal and N into Free State province in E foothills; in Australia found throughout New South Wales, Victoria and Tasmania, extending N into SE Queensland and W through S South Australia, with occasional records in W Australia. Introduced population occurs throughout much of New Zealand, and this species also reaches Fiji, with vagrants on other islands in this region. Increase in numbers wintering in Japan, Korea and Hong Kong suggests possibility of an undiscovered breeding population in E Asia. In parts of its natural Eurasian range, this species is encouraged through provision of nestboxes, as claimed to reduce some insect pests, although only one study (of an introduced population in New Zealand) has confirmed any beneficial impact, and then only under very specific conditions. In contrast, it damages foodstuffs that are important to people and domestic stock and it can transmit some diseases of domestic stock; in addition, its urban roosts can damage trees, and droppings render surrounding areas dangerously slippery and deface buildings, and can also present a public-health and animal-health threat. Formerly a regular source of food in some European countries, and was in the past kept as a cagebird; little such exploitation exists today.

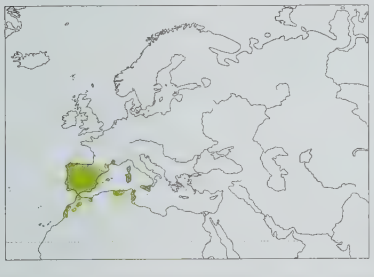
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41. **Spotless Starling**

Sturnus unicolor

French: Étourneau unicolore **German**: Einfarbstar **Spanish**: Estornino Negro
Other common names: Mediterranean Starling

Taxonomy. *Sturnus unicolor* Temminck, 1820, Sardinia.
Forms a superspecies with *S. vulgaris*; formerly considered conspecific, and genetic differentiation only slight, some hybridization occurring in area of breeding overlap. On basis of recent molecular data, coupled with behaviour, may be only distantly related to some of the other species often assigned to present genus. Monotypic.
Distribution. Iberian Peninsula, S France, N Africa (Morocco, NE Algeria and Tunisia), and Mediterranean islands of Corsica, Sardinia and Sicily.



Descriptive notes. 22 cm; 70–100 g. Medium-sized starling with feathers of crown, nape, throat and upper breast greatly elongated (up to twice length of same feathers on *S. vulgaris*). Male has black body plumage with metallic iridescence, purplish on head and upper breast, oily green on back and belly; wing blackish, some mauve gloss on outer webs of innermost remiges; tail blackish-brown; iris dark brown; bill yellow with blue to bluish-black base; legs pink or reddish-pink. In fresh plumage (after post-nuptial moult), feathers have greyish margins, producing slight grey bloom; occasionally, elongated feathers of head and upper breast have small V-shaped white markings at tip, but such markings more commonly restricted to belly; male becomes more glossy as feathers abrade and all tips and margins lost; bill black in non-breeding season; legs duller and usually darker during moult period. Female is similar to male but less glossy, with shorter feathers on head and upper breast, diagnostic paler margins on wing feathers; in freshly moulted plumage, grey margins of feathers produce usually more extensive greyish bloom than in male; more often with small V-shaped white markings at feather tips, especially on vent and undertail-coverts, but tips and margins soon abrade (giving unspotted appearance); iris brown, paler inner or outer ring; bill in breeding season yellow with pinkish-brown base; legs brownish-pink. Juvenile is uniformly brown, often darker than juvenile of *S. vulgaris*, with no streaking on breast or belly, whitish chin and throat, sometimes pale margins on remiges; iris brown, bill blackish, legs brown. After post-juvenile moult, similar to non-breeding adult but with small pale feather tips all over, these still visible in spring at least on undertail-coverts, and often more developed in females; many birds, especially females, have background colour dark ash-grey rather than black. Voice. Male sings in most months; both sexes sing in winter, and at roost. Song consists of whistles and warbling phrases, which include mimicry of at least 15 other species; similar in structure to that of *S. vulgaris*, but louder (particularly the whistles). Whistles are most frequent calls in non-breeding season; harsh alarm calls, also high-pitched distress calls recorded. In areas of sympatry with *S. vulgaris* in NE Spain, both species share same dialect, and interspecific song-matching is frequent, with similarity of repertoire comparable to intraspecific variation of the two in areas of allopatry.
Habitat. Open woodland with expanses of short grass, often in association with grazing mammals; farmland, parks, gardens and cities. Up to 2500 m in mountains in summer. Communal roosts throughout the year, in summer often containing mainly juveniles, after breeding up to 20,000 birds, and may form mixed winter roosts with *S. vulgaris* of more than 100,000 birds; aerial gyrations by flocks prior to entering the roost site.
Food and Feeding. Omnivorous, animal food predominating in spring and summer, fruit and seeds in autumn and winter. Vertebrates taken include small frogs and toads (Amphibia), lizards (Reptilia), and shrews (Soricidae) and mice (Muridae); invertebrates primarily insects, mostly adult and larval beetles (Coleoptera), especially dung beetles (Scarabaeidae), weevils (Curculionidae), leaf beetles (Chrysomelidae), ground beetles (Carabidae) and grain beetles (Tenebrionidae), but including also grasshoppers (Orthoptera), ants and wasps (Hymenoptera), bugs (Hemiptera), adult flies and maggots (Diptera), caterpillars of butterflies and moths (Lepidoptera), cockroaches (Blattodea) and dragonflies (Odonata); other invertebrates taken are e.g. small snails (Gastropoda), earthworms (Lumbricidae), spiders (Araneae), mites (Acarina), ticks (Ixodida), harvestmen (Opiliones), scorpions (Scorpiones), pseudoscorpions (Pseudoscorpiones), centipedes (Chilopoda) and millipedes (Diplopoda). Plant food consumed includes seeds of docks and knotweeds (Polygonaceae), fruits of nightshade (*Solanum*), mastic (*Pistacea*), brambles (*Rubus*) and oaks (*Quercus*), and buds and flowers of elm (*Ulmus*) and poplar (*Populus*). Diet includes cultivated plants such as cherries and plums (*Prunus*), grapes (*Vitis*) and olives (*Olea*). Takes nectar from agave (*Agave*) flowers. Over the whole year in Spain, diet 60% animal food and 40% plant food. Most food collected on ground, with open-bill probing used extensively in extracting invertebrates from soil and grass; when foraging with cattle, hawks insects disturbed by the animals, removes ticks and flies from their bodies, and takes insects and seeds from dung. Feed in foliage on defoliating caterpillars during breeding season, and hawks insects; young fed predominantly with animal food. Winter flocks move in "roller-feeding" style, individuals from the rear constantly flying forward to land in front; these flocks often associated with *S. vulgaris*; in study in WC Spain, present species consistently formed larger feeding flocks than those of *S. vulgaris*.
Breeding. Season Apr to mid-Jul in Spain and Mar–Jul in Morocco; often double-brooded. Primarily monogamous; some males polygynous, and at some colonies majority of males sometimes mated with two females (experimental manipulation of male hormone levels, and provision of additional nestboxes, increased frequency of polygyny); extra-pair copulations occur, primarily by early-breeding males during incubation period of mates. Colonial nester; colonies densest where sufficient nest-sites available, e.g. in roofs. In areas of sympatry with *S. vulgaris* in NE Spain, mixed colonies frequent, and breeding of both species is synchronized. Nest built by both sexes, mainly from dry grass, lined with grass, roots, leaves and feathers, often yellow flowers included in structure, and fresh green leaves, including those of exotic eucalypts (*Eucalyptus*), may be added; male adds green leaves prior to incubation, apparently as part of courtship and to stimulate female to lay, female brings feathers during laying and incubation; sited in natural hole or old hole of woodpecker (Picidae) in tree, or in disused burrow of European Bee-eater (*Merops apiaster*) or Collared Sand Martin (*Riparia riparia*), or in old nest of White Stork (*Ciconia ciconia*), Eurasian Jackdaw (*Corvus monedula*) or sparrow (*Passer*); also artificial structures widely used, most often sites under roof tiles, or cavity in wall, building or wheat stack; nestboxes used. Clutch 4–5 eggs in Spain, usually 3–4 in N Africa, eggs plain pale blue; incubation mainly by female, period 11 days; chicks fed by both parents, both also remove faecal sacs, female doing larger share of work, nestling period 21–22 days; young fed by adults for a few days after leaving nest, within a week of fledging form flocks of juveniles, which move away from nesting area. Intraspecific brood parasitism occurs, particularly in first clutches, e.g. at two colonies over four seasons 19–27% of clutches contained parasitic eggs (parasitism up to 40% for first clutches); both male and female eject alien eggs from nest until own clutch started (success of parasitic eggs less than 10%). Of 150 eggs in Spain, 70% hatched and 51% produced fledglings; breeding success in polygynous matings suggests that female quality more important than male assistance in rearing young.
Movements. Largely sedentary. Some ringed individuals found to make extensive movements which may represent dispersal from natal area; some juveniles moved up to 700 km. Seasonal shifts of populations in S Spain imply possible short migrations; flocks from Spain seen flying towards Morocco on Oct mornings, returning at dusk. Non-breeding records from Madeira, Canary Is, Malta, Greece and Libya.
Status and Conservation. Not globally threatened. Common to locally abundant. Common and widespread in Iberia and N Morocco, and locally common in Sardinia; less numerous and more sparsely distributed in Corsica and Sicily. Range expanding in SW Europe; in areas of overlap with *S. vulgaris* expansion has slowed; first overlap area detected around 1977, in NE Spain. Causes damage to olive and cherry crops in some regions.
Bibliography. Berthold (1971), Calvo *et al.* (2000), Cambrony & Motis (1994), Celis *et al.* (2007), Cramp & Perrins (1994), de la Cruz-Cardiel *et al.* (1997), Deceuninck *et al.* (1997), Eens & Pinxten (1999), Feare (1986), Feare *et al.* (1992), Ferrer *et al.* (1991), Fry *et al.* (2000), Gallego & Balcells (1960), Hartert (1918), Lopez-Rull *et al.* (2007), McCarthy (2006), Moreno *et al.* (2002), Motis (1992, 1994, 1996), Motis *et al.* (1983), Pascual (1992), Peris (1980a, 1980b, 1981, 1983, 1984, 1988, 1991), Polo & Veiga (2006), Ruthke (1971), Smith (1965), Telleria (1981), Thévenot *et al.* (2003), Veiga & Polo (2005), Veiga, Moreno, Arenas & Sanchez (2002), Veiga, Moreno, Cordero & Minguez (2001), Veiga, Polo & Vinuela (2006), Verheyen (1994), Walter & Demartis (1972).

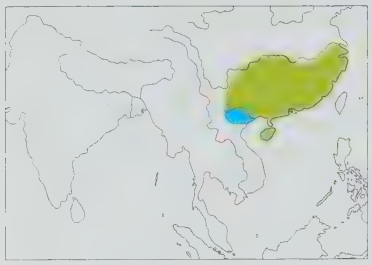
Genus *POLIOPSAR* Sharpe, 1888

42. **Red-billed Starling**

Poliopsar sericeus

French: Étourneau soyeux **German**: Seidenstar **Spanish**: Estornino Piquirrojo
Other common names: Silky Starling

Taxonomy. *Sturnus sericeus* J. F. Gmelin, 1789, China.
Genus formerly merged with *Sturnus*. Monotypic.
Distribution. SE China from S Sichuan E, S of R Yangtze, to Shanghai, S to Hainan I and Guangdong.
Descriptive notes. 22 cm; 65 g. Medium-sized starling with forehead, crown and nape feathers somewhat elongate and hackle-like. Male has white head, dark grey lower side of neck and uppermost mantle (forming diffuse but contrasting collar), slightly paler slate-grey mantle and back, rump paler; wing black, with bluish or greenish-purple gloss on outer webs of remiges, bases of primaries white, lesser wing-coverts slate-grey with white margins on outer feathers, primary coverts with white outer webs forming white wing patch; tail black, glossed green; breast and flanks grey, belly and undertail-coverts white; iris bluish, with white ring; bill red, tip sometimes black; legs chrome-yellow to dull orange. Female is similar to male but duller, with head, breast and underparts tinged brown, giving less contrast between head and body, back brown, rump pale buff,



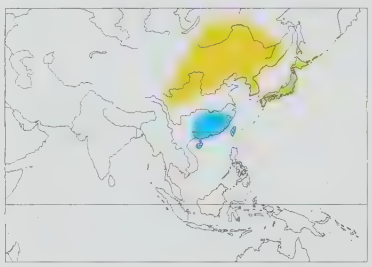
wings and tail brown with some gloss; has grey-brown stripe on side of crown and dark malar stripe. Juvenile apparently undescribed. Voice. Song described as melodious; chattering calls from flocks, reminiscent of *Sturnus vulgaris*.
Habitat. Open areas with scattered trees in hilly country and at low altitudes; also cultivated areas, gardens and scrub.
Food and Feeding. Diet apparently insects and fruit. Forages in trees and on ground; not seen to associate with cattle. Occurs in large flocks outside breeding season.
Breeding. Nest placed in in hole in tree, in roof or in wall of house. Eggs plain blue-green. No other information available.
Movements. Presumed to be resident or partial migrant in most of range. Non-breeding visitor Nov–Mar in Vietnam and Hong Kong, which may represent migrants from N part of breeding range. Formerly a vagrant in Japan, now an annual visitor; in recent times, scarce winter visitor to Taiwan. Vagrants recorded in Korea and Philippines.
Status and Conservation. Not globally threatened. Generally fairly common. Numbers thought to be probably stable or perhaps increasing. Nowadays regular in non-breeding season in Japan, having previously been considered a vagrant there. In Hong Kong (non-breeding), communal roosts of up to 5000 individuals recorded; in C Annam (Vietnam), flock of c. 2000 birds noted in paddyfields, Feb 2008.
Bibliography. Brazil (1990), Chalmers (1986), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1987), Dickinson *et al.* (1991), Étchécopar & Hüe (1983), Kennedy *et al.* (2000), Lee Kwok Shing *et al.* (2007), Ma Suquan (1989), Mees (1997), duPont (1971), Robson (2000), Zhang Chunlan *et al.* (2006), Zhang Yongpu *et al.* (2006).

43. White-cheeked Starling

Poliopsar cineraceus

French: Étourneau gris **German**: Weißwangenstar **Spanish**: Estornino Gris
Other common names: Grey/Ashy(!) Starling

Taxonomy. *Sturnus cineraceus* Temminck, 1835, Japan.
Genus formerly merged with *Sturnus*. Monotypic.
Distribution. Breeds SE Transbaikalia E to SE Russia (R Ussuri), S to C & E Mongolia, N China (E from E Qinghai and Sichuan), Korea, S Sakhalin I, Japan and S Kuril Is; non-breeding S China (including Hainan I and Hong Kong) and Taiwan.



Descriptive notes. 22 cm; 68–95 g. Medium-sized, brownish-grey starling with nape and throat feathers hackled, nape feathers also elongate. Male typically has black forehead, crown and nape with some greenish-blue gloss, cheek white with some black streaking; head plumage variable, sometimes largely dirty white with varying amounts of black (birds with mainly white head have crown and nape feathers non-glossy); mantle and back brownish-grey, rump white; wing brown with slight greenish gloss, outer webs of secondaries fringed white (forming white wingbar on closed wing); tail dark brown with slight greenish gloss, inner webs of rectrices tipped white, more broadly on outer feathers; throat to upper breast sooty-grey, sometimes with scattered white or white-tipped feathers, lower breast and flanks paler grey to off-white, belly and undertail-coverts white; iris brown, sometimes with pale yellow inner ring; bill orange to orange-yellow with dark base of lower mandible, in winter orange or yellow with dark brown tip of upper mandible and distal half of lower mandible; legs yellow-orange. Female is browner than male and lacks black cap, but has white cheek, white rump, and white tips of inner webs of rectrices. Juvenile is like female, but has brown streaking on white cheek, rump whitish, remiges and rectrices lack gloss, and has bill dark horn with darker tip, legs horn-brown. Voice. Call a monotonous "chir-chir-chay-cheet-cheet", with creaky quality; trilling begging call from nestlings.
Habitat. Open areas, including cultivated land, pastures, open woodland, parks and towns; sometimes in sparse, boggy larch (*Larix*) forest in Russia; often in riparian woodland in Mongolia. Avoids denser forest. Lowlands; up to 1200 m in Japan (Honshu), and up to at least 1300 m in N Mongolia. Communal roosts throughout the year; birds may fly up to 40 km each day to forage; some overlap in feeding areas of birds from different roosts; some roost sites and feeding areas have remained constant for more than 40 years; pre-roost assemblies up to 2 km from roost site.
Food and Feeding. Omnivorous, but diet primarily invertebrates, particularly insects. Animal food includes geckos and other lizards (Reptilia), frogs (Amphibia), earthworms (Annelida), spiders (Araneae), crayfish (Astacoidea), isopods (Isopoda), and many insects, e.g. beetles (Coleoptera), larval butterflies (Lepidoptera), grasshoppers (Orthoptera), flies and maggots (Diptera), ants and bees (Hymenoptera); mole-crickets (Gryllotalpidae) often the main food fed to nestlings. Fruits include cherries (*Prunus*), mulberries (*Morus*) and strawberries (*Fragaria*); more fruit taken in winter months, then including also *Melia azedarach*, *Sapium sebiferum*, *Cinnamomum camphora*, *Diospyrus kaki* and *Ligustrum lucidum*. Most food collected on ground. Forages on ploughed fields and on newly mown grassland, using open-bill probing to collect prey just below soil surface. In non-breeding range forages mostly in rice-growing areas. Gregarious at all times.
Breeding. Season Apr–Jul; two broods in Japan. Monogamous. Usually in colonies of up to 30 pairs; first clutches highly synchronous. Nest an untidy structure of grass, lined with feathers, built in hole in tree or under house eaves, in roof cavity or in nestbox, in Mongolia also excavates own hole in sand in steep riverbank; exceptionally, will nest in open situation. Clutch 2–10 eggs, mostly 5, clutch size larger in urban areas, also varies annually and declines during course of season; eggs pale blue-green or azure blue; incubation by both sexes, female doing most of work, period 12–13 days; chicks fed by both parents, nestling period 21–22 days. Occasional interspecific brood parasitism, female of present species laying in nests of *Agropsar sturninus*. Intraspecific brood parasitism recorded regularly, 18–24% of nests in one study; no eggs removed when parasite female adds an egg to clutch; late breeders appear to be responsible for most parasitism, behaving as floaters during early part of breeding season. Hatching success more than 80% in Japan, and 67–77% of nestlings reach fledging stage.
Movements. Summer visitor in N Japan (Hokkaido); resident in C & S Japan, where populations also augmented by winter visitors from N. Migratory in most of range. Arrives in breeding areas early, from Mar, with the majority present by early Apr; post-breeding wandering in nomadic flocks, followed by autumn departure in Oct, some birds remaining on breeding grounds until Nov. Non-breeders reach Hong Kong in Oct, and remain until Mar–Apr. Vagrants recorded in N Myanmar, NW Thailand and Philippines.
Status and Conservation. Not globally threatened. Common throughout range; very common in parts of Japan. During non-breeding season roosts can hold in excess of 50,000 individuals. Considered a pest species in Japan.
Bibliography. Asakawa (1973), Brazil (1990), Chalmers (1986), Chen Fuguan *et al.* (1998), Dementiev *et al.* (1954, 1970), Dickinson *et al.* (1991), Duckworth & Moores (2008), Hashiguchi & Ueda (1990), Jahn (1942), Kennedy *et al.* (2000), Kuroda (1955, 1956, 1957, 1959, 1960a, 1960b, 1961, 1962a, 1962b, 1963a, 1963b, 1964a, 1964b, 1973, 1975), Nechaev (1975a), duPont (1971), Rasmussen & Anderton (2005b), Robson (2000), Saitou (2001), Taiga (2005), Takenaka & Takenaka (1994), Takenaka *et al.* (1987), Tomek (2002), Umeda *et al.* (1993), Winter & Sokolov (1983), Won Pyong-Oh (1961b), Yamaguchi (1997, 2000), Yamaguchi & Saitou (1997).

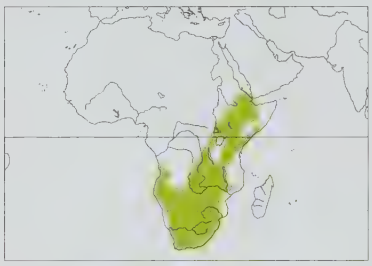
Genus *CREATOPHORA* Lesson, 1847

44. Wattled Starling

Creatophora cinerea

French: Étourneau caronculé **German**: Lappenstar **Spanish**: Estornino Carunculado

Taxonomy. *Rallus cinereus* Meuschen, 1787, Cape of Good Hope, South Africa.
Monotypic.
Distribution. Eritrea, Ethiopia and NW & S Somalia S to Uganda, Rwanda, Burundi, Kenya and Tanzania, also from W & S Angola and SE DRCongo S to Zambia, Malawi, Mozambique, Namibia, Botswana, Zimbabwe, Lesotho, Swaziland and throughout South Africa.



Descriptive notes. 21 cm; 64–85 g. Medium-sized, greyish starling with white rump in all plumages. Male in non-breeding condition has light grey body plumage, with white rump, and off-white belly and undertail-coverts; remiges black with bronzy sheen, some or all wing-coverts white (considerable individual variation, in part age-dependent); tail black with bronzy sheen; iris brown, small triangular patch of bare yellow skin below and behind eye; two bare dark streaks on throat extending down from base of lower mandible; bill pale brown to flesh-coloured; legs light brown. Breeding male may lose all feathers of head, chin and throat and develop pendulous wattles of variable size; skin of forehead, lores, centre of crown, chin and throat black, posterior crown, ear-covert region and area below eye bright yellow; one or more small wattles may develop on black areas on top of head, and paired pendulous wattles grow from bare throat streaks (may fuse to form single "dewlap", but great individual variation in pattern of wattle development); bill light pinkish to flesh-coloured, with black base. Female resembles non-breeding male, but remiges and rectrices dark brown with slight gloss, wing-coverts grey; some old females may have black remiges and rectrices, and even develop bald pigmented areas and wattles. Juvenile is like young female, initially has yellow bill. Voice. Song long wheezy phrases of more than 20 seconds, given during courtship approach to female, also in "undirected" way by male when perched or in group; apparently not territorial in function. Alarm call described as double squeak; trisyllabic flight call; female solicits male with high-pitched twittering.
Habitat. Lightly wooded dry savanna, also open and cultivated lands, usually with short grass; often in arid regions. Generally below 2000 m; recorded up to 3000 m in E Africa.
Food and Feeding. Diet primarily insects; also plant matter, including nectar. Insects taken include locusts (Acrididae), beetles (Coleoptera), termites (Isoptera), caterpillars (Lepidoptera), mantids (Mantodea) and lacewings (Neuroptera). Plant food includes fruit of figs (*Ficus*), berries of *Zizyphus mucronata*, *Ehretia rigida*, *Pollichia campestris* and *Azima tetracantha*, arils of *Acacia cyclops*, grapes and crushed maize (*Zea mays*); nectar taken from *Erythrina caffra*, *Schotia brachypetala*, *Acrocarpus fraxinifolius*, *Aloe marlothii*, *Grevillea* and *Agave sisalana*. At breeding colonies young fed primarily with locally abundant insects, such as locust hoppers (immature locusts), crickets (Grylloidea), karoo caterpillars (*Loxostege frustalis*), "mopane worms" (*Imbrasia belina*), and caterpillars of lucerne butterfly (*Colias electo*) or of the moth *Laphygma exemta*. Forages on ground, often employing open-bill probing (the only African starling with appropriate anatomical adaptations for this mode of feeding). Forages in association with wild and domestic ungulates; perches on white rhinoceros (*Ceratotherium simum*), blue wildebeest (*Connochaetes taurinus*) and Burchell's zebra (*Equus burchellii*) and may remove ectoparasites from them, and from sheep. Associates also with African elephants (*Loxodonta africana*), but whenever it tries to perch on them displaced by the elephants. Frequent follower of locust swarms. Scavenges at abattoirs, carrion, and rubbish heaps, probes in elephant dung, and forages in rocky intertidal zone on South African coast. Gregarious, usually in flocks of up to 30 individuals; sometimes in huge gatherings containing thousands. In S of range often associates with *Lamprotornis bicolor*, and may share roost-sites; in non-breeding season also shares roosts with *Acridotheres tristis*, *Sturnus vulgaris*, *Onychognathus morio* and Cape Weavers (*Ploceus capensis*) in South Africa, and with *Lamprotornis nitens* and *L. chalybaeus* farther N. In Kenya forages in association with *L. chalybaeus*, also with Chestnut Weaver (*Ploceus rubiginosus*) and *L. superbus*, less often with *Cinnyricinclus leucogaster* or *L. hildebrandti*.
Breeding. Often apparently opportunistic, related to abundant insect food; Jul in Eritrea, May–Aug in Ethiopia, May in Somalia, Apr–May, Jul and Dec in Kenya and Tanzania, and Nov–Apr in Botswana; in S Africa largely seasonal, Sept–Nov in winter-rainfall region, Jan–Mar in summer-rainfall zone. Monogamous; extra-pair copulations noted in captive flock. Colonial, sometimes thousands of nests covering several square kilometres, colony sometimes abandoned abruptly if food supply in area fails. Free-standing nest ball-shaped, with side entrance, made of twigs and thorny branches, lined with grass or feathers, placed 1–10 m above ground in tree or bush (both native and exotic species used); nests may be clustered together to form a single mass with separate entrances. Clutch 3–4 eggs, pale blue, sometimes with faint brown spots; incubation by both sexes, period 11 days, hatching closely synchronized within colony; chicks fed by both parents, nestling period 13–16 days; young leave nest before able to fly, and are vulnerable to avian predators at this stage.

Movements. Highly nomadic; although breeding mainly seasonal, location of colonies dependent on abundance of insect food, and movements generally not predictable. Formerly huge numbers reported in SW Uganda in association with red locust (*Nomadacnis septemfasciata*) outbreaks. In some areas, such as Zambia, a regular dry-season visitor with movements more like those of a regular migrant; also regular non-breeding visitor to Laikipia Plateau, Kenya. Recorded (non-breeding) occasionally in W Africa (Gambia, Senegal, Ghana, Nigeria, Cameroon, Gabon, PRCongo and Central African Republic); irregular visitor in Arabian Peninsula (Yemen and Oman), and vagrants recorded from Seychelles and Madagascar.
Status and Conservation. Not globally threatened. Very widespread and locally common. Population in Kruger National Park, in South Africa, estimated at more than 130,000 individuals, and in Kgalagadi Transfrontier Park, covering SW Botswana and adjacent NW South Africa, more than 16,000 birds; population can at times exceed 10,000 individuals in S Mozambique, but much less common in C Mozambique, where estimated at minimum of 1000 birds. Huge aggregations containing "tens of thousands" of individuals formerly reported in SW Uganda in association with locust outbreaks, but currently few flocks hold more than 100 birds. Breeding not reported from Uganda since 1940; also no published breeding records for Sudan, DRCongo, Angola, Zambia, Malawi and Mozambique. Breeding occurs mainly in sparsely populated regions. Formerly protected as a "locust-bird", believed to be useful in control of locusts; is now sometimes shot for causing damage in commercial grape-growing areas.
Bibliography. Aspinwall (1986), Barber (1880), Barnes (1986), Bennun *et al.* (1990), Borrow & Demey (2001), Broekhuysen *et al.* (1963), Brooke (1989), Carswell *et al.* (2005), Chapin (1954), Cooper (1976), Craig, A.J.F.K. (1992, 1996), Craig, A.J.F.K. & Herremans (1997a), Crandall (1949), Cunningham-van Someren (1974), Dean (1978b), Dean & Macdonald (1981), Dowsett *et al.* (2008), Feare & Gill (1997), Fry *et al.* (2000), Fuggles-Couchman & Elliott (1946), Gallagher & Woodcock (1980), Godfrey (1922), Grindley (1964), Hamilton (1959), Hobberstad (2008), Hockey *et al.* (2005), Hoesch (1936), Jacot Guillarmod *et al.* (1979), Kemp *et al.* (2001), Koenig (1994), Kok & van Ee (1990), Liversidge (1961), Meyer de Schauensee (1928), Mwashi *et al.* (2002), Nikolaus (1987), Nuttall (1998), Parker (1999, 2005), Paxton & Cooper (1986), Pringle (1971), Robinson *et al.* (1957), Saunders *et al.* (1993), Short & Horne (2005), Sieber (1980), Skead, C.J. (1995), Skead, D.M. (1966), Skerrett *et al.* (2001), Skinner (1995), Smith (1957), Sontag (1978, 1979a, 1979b, 1979c, 1980, 1981a, 1981b, 1985a, 1985b, 1985c, 1989, 1990, 1991a), Symes *et al.* (2008), Thomsen (1907), Uys (1977), Webb (1951).

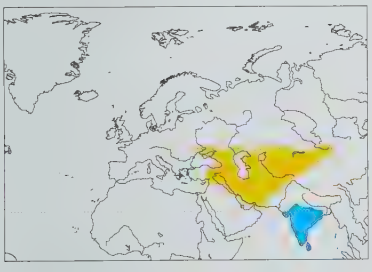
Genus *PASTOR* Temminck, 1815

45. **Rose-coloured Starling**

Pastor roseus

French: Étourneau roselin **German**: Rosenstar **Spanish**: Estornino Rosado
Other common names: Rosy Pastor, Rosy Starling

Taxonomy. *Turdus roseus* Linnaeus, 1758, Lapland and Switzerland.
Genus often subsumed into *Sturnus*. Monotypic.
Distribution. Breeds regularly from S Ukraine E to lower Volga steppes, C & E Kazakhstan, W Altai and W Mongolia, S to E Turkey, S Iran, Afghanistan and NW China (W & N Xinjiang); occasionally SE Europe W to Czech Republic, Hungary and Italy, and possibly now breeding annually in Bulgaria, also occasionally farther E in Russia (to upper R Yenisey). Non-breeding mainly India and Sri Lanka.



Descriptive notes. 21 cm; 60–88 g. Medium-sized starling with nape feathers hackled and elongate, forming long erectile crest. Male has head and neck to throat and upper breast black, glossed purple, upperparts, lower breast and belly pale pastel pink, undertail-coverts blackish; wing blackish-brown, green iridescence on secondaries; tail blackish-brown with green iridescence; iris dark brown; bill pink distally with black base during breeding, dark brown or blackish in autumn, brownish-pink in winter; legs yellowish-horn. In fresh plumage after complete moult (in late summer), male has black feathers tipped buffy grey tips, pink feathers tipped brown, black undertail-coverts dull with brown tips, remiges and wing-coverts with buff margins (abrasion of feather tips produces characteristic black-and-pink plumage). Female is similar to male but somewhat duller, with shorter crest; retains buffy feather tips in spring, so that throat, nape and undertail-coverts appear brown. Juvenile is sandy grey-brown above, rump paler and with pinkish or buff tinge (contrasting with back in flight), ear-coverts pale, wings and tail brown with buff feather margins, buff below, chin and throat paler and with dark feather centres (producing spotted appearance), pale eyering; bill horn-coloured, base bright yellowish or orange, legs pinkish-yellow or straw-coloured; first-winter bird has dull black head, crown feathers brown-tipped and not elongated, back and underparts browner than adult, undertail-coverts dull black with buff tips. Voice. Song a long series of bubbling, warbling, whistled and grating phrases, apparently not including mimicry; song given from ground in courtship, during latter stages of which female emits loud "tsili-tsili-tsili". Feeding and roosting flocks maintain constant chatter; flight call and alarm call short and harsh, resemble those of *Sturnus vulgaris*.
Habitat. Breeds on open steppes where orthopterans (locusts and other grasshoppers) abundant; colonies usually near water, often in valleys. After breeding, moves to more wooded areas. In non-breeding season found in wide variety of habitats, including wooded areas and open country. Roosts communally in thorn bushes, trees and reedbeds, often with other starling species, also with parakeets (*Psittacula*), crows (*Corvus*), *Ploceus* weavers and sparrows (*Passer*); also forms daytime roosts near feeding and drinking sites.
Food and Feeding. Insectivorous during breeding season, when diet dominated by locusts and other grasshoppers; more fruit taken after breeding, and in winter diet includes insects, fruit, seeds and nectar. Importance of locusts in diet perhaps overemphasized, although individual birds can eat 120–220 locusts (particularly flightless hopper instars of *Dociostaurus maroccanus* and *Calliptanus italicus*) per day; also takes other insects, such as bugs (Hemiptera), ants (Formicidae), beetles (Coleoptera), and moths and caterpillars (Lepidoptera), including winter moth (*Operophtera brumata*), an important pest species; spiders (Araneae), woodlice (Isopoda) and snails (Gastropoda) also eaten. Fruits taken from figs (*Ficus*), *Lonicera* and *Solanum*, also from cultivated mulberries (*Morus*), vines (*Vitis*), cherries and plums (*Prunus*), apricots (*Prunus armeniaca*), pears (*Pyrus*), raspberries (*Rubus*), dates (*Phoenix*) and chillies (*Capsicum*); fruits of *Pithecelobium dulce* important for fat-storing prior to spring migration. Seeds of cereals such as wheat, sorghum and millet taken. Nectar taken from flowers of *Bombax*, *Butea*, *Careya* and *Erythrina*; feeds intensively at *Bombax ceiba* trees in flower, displacing sunbirds (Nectariniidae) and squirrels (Sciuridae), but dominated by *Acridotheres* mynas. Most locusts taken on the ground, birds hurrying in one direction, those at the back of flock flying over those in front so that group moves in a "roller-feeding" manner. Sometimes accompanies cattle. Highly gregarious at all times; forages in flocks, sometimes large ones.
Breeding. Breeds May–Jul; short season closely tied to food availability, and breeding may be abandoned prematurely if food supply fails. Monogamous. In large colonies often of hundreds and up to several thousands of nests, occasionally tens of thousands. Nest built rapidly, by both sexes, from grasses and twigs, lined with finer grasses and feathers (often starling feathers), cup may include aromatic plants such as wormwood (*Artemisia*), giant fennel (*Ferula*) and the poaceous grass *Aeluropus*; placed in hole, most frequently in interstice between stones on scree slope, sometimes in crack in rock or cliff, among stones on railway embankment or quarry, in hole or crevice in building, under eaves or in thatch, or occasionally hole of Collared Sand Martins (*Riparia riparia*) used or even hole in tree, particularly willow (*Salix*); in dense colonies adjoining nests may coalesce. Clutch 3–6 eggs, pale blue to azure blue; incubation by both sexes, both may develop brood patch but female much more frequently, period estimated at 15 days; chicks fed by both parents, nestling period c. 24 days; young fed by both adults for a short period after leaving nest. Intraspecific brood parasitism reported; frequency not known. No information on breeding success, but numerous avian and mammalian predators attracted to colonies.
Movements. Migratory; also nomadic during post-breeding dispersal, which begins when most nestlings have fledged, usually in Jun–Aug. Non-breeding grounds in Indian Subcontinent, primarily in N peninsular India from Gujarat E to Bihar and S through the Deccan, also regularly in Sri Lanka; sometimes common in Kerala (SW India). Autumn migration from Jul to mid-Oct, adults leaving before juveniles; in W of breeding range migration almost due W–E, but farther E predominant direction SE, with passage through Pakistan into India on narrow front between Kangra Valley and Baluchistan. Among earliest winter migrants reaching India, remaining until Mar–Apr; on rutun migration reaches breeding areas from mid-Apr to early Jun. Also irregular non-breeding visitor in small numbers in Oman. Recorded as accidental visitor in Iceland, Faroes, Britain, Ireland, France, Spain, Fennoscandia, Germany, Poland, Austria, Switzerland, Malta, Albania, N Africa (Algeria E to Egypt), Lebanon, Jordan, Kuwait, Seychelles, E Asia (SW Myanmar; Thailand; Malaysia; Shanghai, in China; Korea); recently recorded also in sub-Saharan Africa in Ethiopia and in South Africa (Kgalagadi Transfrontier Park). Individual ringed in Hungary recovered 10 months later in W Pakistan, 4800 km to SE.
Status and Conservation. Not globally threatened. Common to abundant; breeding colonies can contain tens of thousands of nests, and migrating birds have been estimated in millions. Location of breeding colonies in any one year determined largely by local abundance of Orthoptera, and colonies therefore established erratically outside main area, sometimes extending W as far as Czech Republic, Hungary and Italy and in most of SE Europe; possibly now an annual breeder in Bulgaria. Widely regarded as beneficial because it consumes large quantities of grasshoppers and locusts. Conversely, may also damage mulberries, grapes and cereal crops in post-breeding period, when fruit and other plant material more important in diet.
Bibliography. Abdulali (1947), Ali (1932), Ali & Ripley (1972), van den Berg (1982), Buzun (1987), Chen Fuguan *et al.* (1998), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Dubinin (1953), Fry *et al.* (2000), George (1976), Haffer (1993k), Herroelen (1987), Hölzinger (1992a, 1992b), Ivanov (1969), Kazakov (1976), Kekilova (1978), Korelov *et al.* (1974), Legge (1880), Li Shichun *et al.* (1975), McCarthy (2006), Naik & Naik (1969), Nyagolov *et al.* (2003), Patrikeev (2004), Pek & Fedyanina (1961), Rasmussen & Anderton (2005b), Roberts, P.J. (1982), Roberts, T.J. (1992), Robson (2000), Rogacheva (1992), Rustamov (1958), Sagvik (2009), Saligbaev & Bogdanov (1967), Schenk (1907, 1929, 1935), Schollaert (2006), Serebrennikov (1931), Skerrett *et al.* (2001), Stafford (2004), Stepanov (1987), Stepanyan (2003), Wells (2007), Zenatello & Kiss (2005).

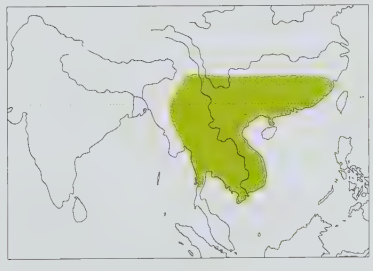
Genus *GRACUPICA* Lesson, 1831

46. **Black-collared Starling**

Gracupica nigricollis

French: Étourneau à cou noir **German**: Schwarzhalsstar **Spanish**: Estornino Cuellinegro
Other common names: Black-collared Myna, Black-necked Starling

Taxonomy. *Gracula nigricollis* Paykull, 1807, Canton (Guangzhou), Guangdong, China.
Genus often merged with *Sturnus*. Monotypic.
Distribution. Myanmar (except W & SW) and S & SE China (S from Yunnan and N Fujian) S to N peninsular Thailand and S Indochina. Introduced in Taiwan.



Descriptive notes. 28 cm; 122–178 g. Large starling with mostly pied plumage; feathers of forehead and crown hackled. Has forehead, crown, chin and throat white, slightly iridescent black collar around neck and down to upper breast; mantle and back dark sepia-brown, rump white; wing darker sepia-brown, remiges blackish, secondaries tipped white, primary coverts white, secondary coverts blackish-brown with prominent white tips; tail chocolate-brown, rectrices tipped white, broader tips on outermost feathers; lower breast, belly and undertail-coverts white, often tinged with grey-brown (looking dirty); iris dark brown with narrow fleshy-grey outer ring, bare yellow skin around eye extending in triangle behind eye; bill blackish; legs lead-grey to dull purplish-brown. Sexes alike. Juvenile lacks black collar, has head, neck and breast brownish-grey, streaked white, back browner than adult. Voice. Calls include shrill rattles and melodious notes and harsh whistles; disyllabic "tiu tiu" during display between partners; harsh "kraak" probably an alarm call.
Habitat. Open areas, including grassland, rice stubble, cultivated fields, lawns and settlements; also dry, stunted forest. Mainly lowlands, but recorded to 2000 m.
Food and Feeding. Earthworms (Oligochaeta), grasshoppers and crickets (Orthoptera); seeds also recorded as eaten. Forages primarily on the ground, including among grazing cattle. Generally in pairs or small groups.

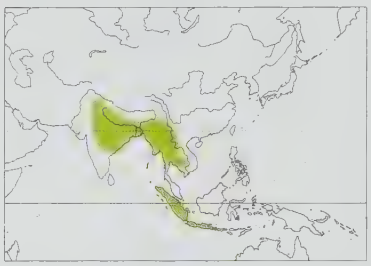
Breeding. Season Mar–Jul in China, and Feb–Aug in Myanmar and SE Asia; multi-brooded. Presumed monogamous. Often in colonies, within which timing by pairs may be synchronized. Nest a large untidy, domed structure, built from twigs, rice straw and grasses, lined with feathers, grass and flowers, placed in tree in field or near open area; nest may be reused in successive years. Clutch 3–5 eggs, blue to blue-green. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Common throughout most of range. Introduced population in Taiwan reported as numbering more than 700 individuals in 1999. Deforestation may allow this species to extend its range. Possibly occurs in NE India (in dry valleys of S Assam hills), but no confirmed records.
Bibliography. Bourlière (1953), Chen Fuguan *et al.* (1998), Deignan (1945), Étchécopar & Hüe (1983), Leven & Corlett (2004), Lin Rueyshing (2001), Rasmussen & Anderton (2005b), Robiller (1990), Robson (2000), Smythies (1986), Sontag (1998, 2002), Wang Shuzhen *et al.* (1983), Wells (2007).

47. **Asian Pied Starling**

Gracupica contra

French: Étourneau pie **German**: Elsterstar **Spanish**: Estornino Pío
Other common names: Pied Starling, (Asian/Indian) Pied Myna

Taxonomy. *Sturnus contra* Linnaeus, 1758, Calcutta, India.
Genus often merged with *Sturnus*. Five subspecies recognized.
Subspecies and Distribution.
G. c. contra (Linnaeus, 1758) – extreme E Pakistan (Lahore area), N & C India (E to W Assam, S to extreme N Karnataka and N Andhra Pradesh), S Nepal and Bangladesh.
G. c. sordida (Ripley, 1950) – NE India (E Assam).
G. c. superciliaris (Blyth, 1863) – NE India (Manipur), Myanmar (except S & E) and SW China (SW Yunnan).
G. c. floweri (Sharpe, 1897) – S & E Myanmar, S China (SE Yunnan), Thailand (except E), NW Laos and Cambodia.
G. c. jalla (Horsfield, 1821) – Sumatra, Java and Bali.
Introduced (presumed nominate race) in United Arab Emirates and Saudi Arabia; also W India (Bombay area) and Japan.



Descriptive notes. 22 cm; 76–90 g. Medium-sized starling with feathers of forehead and crown hackled, and feathers of hindcrown and nape elongated. Nominate race has forehead and cheek area white, rest of head to neck and down to upper breast black, some iridescence on hindcrown, nape and throat; some neck and nape feathers have white shafts and greyish webs, producing faint streaking; mantle and scapulars blackish with sepia-brown tinge, white line along edge of scapulars, back blackish, rump white; wing black, outer lesser coverts and inner median coverts white (forming white wingbar); tail black; lower breast, belly and undertail-coverts greyish-white; iris brownish-orange, bare skin around eye orange; bill red, light horn-coloured or yellow tip; legs yellowish-brown. Sexes alike. Juvenile is browner than adult, lacks iridescence, has cheek patch dirty white. Race *sordida* has underparts greyer than nominate, also less streaking on side of neck, none on nape; *superciliaris* has forehead and crown streaked white, lower breast and belly smoky grey; *floweri* has hackled feathers of forehead and crown buffy white, more gloss on black of mantle, throat and upper breast, legs paler; *jalla* is whiter below, has more extensive bare skin around eye. Voice. Song, by both sexes, a prolonged series of phrases with shrill churrs and a few croaking and buzzing notes, more melodic than that of *Acridotheres tristis*; mimicry of other birds sometimes included. Loud "staar-staar" warning calls, shrill "shree-shree" alarm calls, also trisyllabic flight calls, and myna-like disyllabic calls; chuckles, whistles and high-pitched warbling also described.
Habitat. Open areas with scattered trees and wet ground, often near cultivated areas and human habitation; sewage farms and refuse tips. Mainly in lowlands.
Food and Feeding. Omnivorous, diet includes animal food, fruit, nectar and flowers, and seeds. Fruits taken include those of figs (*Ficus*), *Zizyphus*, *Syzigium* and *Lantana camara*; nectar taken from *Bombax* and *Erythrina*, flower parts of *Butea* and *Grevillea* eaten; cereal grains, including wheat, consumed. Animal food includes frogs (Amphibia), worms (Annelida), snails (Gastropoda), spiders (Araneae), ticks (Ixodidae), and many insects, e.g. grasshoppers, crickets and mole-crickets (Orthoptera), earwigs (Dermaptera), cockroaches (Blattodea), termites (Isoptera), bugs (Hemiptera), flies (Diptera), beetles (Coleoptera), ants, bees and wasps (Hymenoptera), and caterpillars (Lepidoptera). Forages predominantly on the ground, in marshy grassland, on lawns and fields; follows cattle to catch insects disturbed by them, also follows plough on fields. Usually in pairs or in small parties of up to six individuals; larger groups of to 30 in non-breeding season. Communal roosts contain up to 300 individuals.
Breeding. Season Feb–Oct (mainly May–Jul) in India, May–Jul in SE Asia, and Sept–Oct in Java; occasionally double-brooded. Monogamous; ringing studies suggest that partners do not remain together in successive years. Sometimes in loose colonies; sometimes two nests 10–12 m apart in single tree, but generally large territory around nest. Nest built by both sexes, work taking 11–22 days to complete, a large domed structure 60–80 cm wide and 35–50 cm tall, entrance hole on one side (rarely, builds open nest), made from twigs, grass stems, rootlets, palm leaves and feathers, also artiifical materials such as plastic and plastic bags, wool, string, clothing fragments, cellophane and wire, inner chamber lined with finer material; placed 5–15 m above ground in tall tree, in urban areas also on telegraph or electricity pole or lamppost, and sometimes as low as 2 m. Clutch 4–6 eggs in much of range, 3 in Java; eggs pale blue; incubation mainly by female during day and entirely by her at night, period 14–15 days; chicks fed by both parents, chiefly by female, nestling period 21–25 days. Hatching success 87–92% over 4 years, fledging success 52–58% over 5 years.
Movements. Resident. Local movement in extreme NW of range.
Status and Conservation. Not globally threatened. Common to locally abundant in most of Indian Subcontinent range, uncommon in W; common to fairly common in SE Asia; common in Sumatra, Java and Bali. Common in Bombay area of W India, where introduced. Introduced populations breed also in United Arab Emirates, Saudi Arabia and Japan; rare exotic in Taiwan, where has not established itself. Range expanding in some areas; recently spread from N India W into Pakistan. Has been considered by some people to be beneficial to agriculture, as it consumes various insect species regarded as pests.
Bibliography. Ali & Ripley (1972), Ara (1953), Chen Fuguan *et al.* (1998), Gupta & Bajaj (1991), Hoogerwerf & Rengers Hora Siccama (1938), Lever (2005), Lin Rueyshing (2001), Majumdar (1984a), van Marle & Voous (1988), Meier (1988), Naik (1987), Narang & Lamba (1984), Pandey, D.N. (1991), Rasmussen & Anderton (2005b), Roberts (1992), Robson (2000), Smythies (1986), Tyagi & Lamba (1984).

Genus *LEUCOPSAR* Stresemann, 1912

48. **Bali Myna**

Leucopsar rothschildi

French: Étourneau de Rothschild **German**: Balistar **Spanish**: Estornino de Bali
Other common names: Bali Starling, Rothschild's Myna

Taxonomy. *Leucopsar rothschildi* Stresemann, 1912, Bubunan, north coast of Bali.
Monotypic.
Distribution. NW Bali.



Descriptive notes. 25 cm; 70–115 g (captive). Fairly large, white starling with forehead feathers bristly, feathers on crown and nape hackled and greatly elongated, forming erectile crest. Plumage is white, except for black terminal band on tail, black tips on primaries; iris grey, whitish or brown, bare skin around eye and extending to point behind eye bright cobalt-blue; bill grey or brown, becoming paler horn or yellowish towards tip; legs leaden blue. Sexes similar, male having longer crest than that of female. Juvenile has much shorter crest than adult, may also have smoky tinge on back and cinnamon tinge on wings. Voice. Song a wide variety of loud chattering notes, including whistles and piercing, high-pitched notes, often accompanied by raising of crest and bowing; less fluty and repetitive than those of other mynas. Both sexes sing, often without associated display; quieter chattering sometimes accompanies bobbing display. Flight call "creer", also loud "kwuk-kwi" in flight; alarm call a loud "tschick tschick tschick".
Habitat. Open woodland with grass understorey; apparently avoids closed forest.
Food and Feeding. Omnivorous. Takes seeds of *Sterculia foetida*, small fruits of *Lantana camara*, *Deeringia amaranthoides*, *Strychnus ligustrium*, *Passiflora foetida* and *Manilkara kauki*, large fruits such as figs (*Ficus*), *Morus* and papaya (*Carica papaya*); nectar from *Erythrina*. Animal food mainly insects, such as caterpillars (Lepidoptera), ants (Formicidae), termites (Isoptera), dragonflies (Odonata) and grasshoppers (Orthoptera); occasionally worms (Oligochaeta) and small reptiles. Mostly arboreal when foraging; also collects food from ground, particularly when feeding young. Formerly noted as perching on ungulates and foraging for insects in association with the mammals. Anting observed in a bird re-introduced to the wild.
Breeding. Breeds during rainy season, Jan–Apr. Monogamous; long-term pair-bond likely, as partners allopreen and perform other mutual displays. Nest a lining of dry twigs, placed by both sexes in natural tree hole, particularly old hole of woodpecker (Picidae), 4–10 m above ground; nestboxes used in captivity. Clutch 2–3 eggs, in captivity usually 3; eggs pale blue, rarely with faint brown spots; incubation mainly by female, period 12–15 days; chicks brooded by female, fed by both parents, nestling period generally 22–24 days, in captivity up to 28 days; young fed by parents for up to 7 weeks after leaving nest, although start to feed themselves at 4–5 weeks. Hatching success in captivity 68%; productivity low, as normally only one chick survives to fledging stage. Captive females more than 11 years old no longer lay eggs.
Movements. Resident.
Status and Conservation. CRITICALLY ENDANGERED. Restricted-range species: present in Java and Bali Forests EBA. CITES I. Rare; has tiny population within tiny global range. Protected under Indonesian law since 1970, this species has apparently always been restricted to a limited strip across the NW third of Bali, and may have long been uncommon. First discovered in early decades of 20th century; population has since declined drastically, and range contracted greatly. From 200 individuals in early 1980s, population has not risen above 50 since. Habitat destruction, with woodland converted to coconut and kapok plantations and human settlement, has eroded original range, but capture for the local cagebird trade has been, and remains, the major threat. Current estimate of wild population is 24 birds, mostly the result of release of captive-bred individuals as part of the Bali Starling Recovery Plan; more than 1000 in captivity worldwide. In addition, releases of captive-bred birds on small island of Nusa Penida (off SE Bali) have led to establishment there of a second population; by 2008, 49 individuals had been released in Nusa Penida Bird Sanctuary and these have bred, producing total of 16 young. Until the species' security within the Bali Barat National Park can be guaranteed, however, there appears to be little prospect of re-establishing a wild population on Bali. This is considered one of only two starling species which breeds readily enough in captivity to supply the cagebird trade in Europe and North America; there are plans to legalize the breeding and trading of the species in order to open up the market and undermine illegal trade.
Bibliography. Anon. (2008b), van Balen (1996), van Balen & Gepak (1994), van Balen *et al.* (2000), Butchart & Stattersfield (2004), Collar *et al.* (2001), Dijkman (2007), Ezra (1931), Groß (2008), Harrison (1963a), van Helvoordt (1987), van Helvoordt *et al.* (1985), Hughes & Turner (1975), de Jongh (1983), de Jongh *et al.* (1982), MacKinnon & MacKinnon (1991), Pagel (1997, 1999), Plessen (1926), Roles (1973), Schürer (1977), Sieber (1978, 1983), Sontag (1991b, 1996, 2001a, 2001b, 2002), Stattersfield & Capper (2000), West & Pugh (1986), Williams & Feistner (2006).

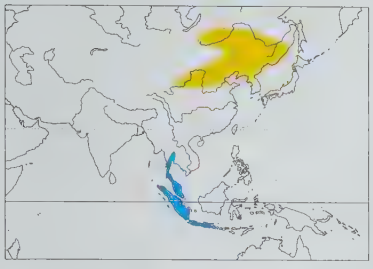
Genus *AGROPSAR* Oates, 1889

49. **Purple-backed Starling**

Agropsar sturninus

French: Étourneau de Daourie **German**: Mongolenstar **Spanish**: Estornino Dáurico
Other common names: Daurian Starling

Taxonomy. *Gracula sturnina* Pallas, 1776, southern Dauria between Onon and Argun rivers, southeast Russia.
Genus often subsumed into *Sturnus*; alternatively into *Sturnia*. May form a superspecies with *A. philippensis*. Monotypic.
Distribution. Breeds E Mongolia, SE Russia (SE Transbaikalia E to Ussuriland), NE & C China (NE Inner Mongolia and Heilongjiang S to S Gansu and Shandong) and N Korea; non-breeding SE Asia and Greater Sundas.



Descriptive notes. 17 cm; 100 g. Small, short-tailed starling. Male has grey head to upper mantle, small patch of glossy purple feathers on rear crown, scattered glossy purple feathers on upper mantle; lower mantle and back glossy purple, rump white or pale brownish; scapulars glossy purple with broad white tips (prominent scapular band); brown primaries, glossy green secondaries and primary coverts, greater and median secondary coverts glossy purple with white tips; tail black with green gloss, outer rectrices with white on outer webs; chin to breast and flanks pale grey, belly and undertail-coverts creamy white; iris dark brown; bill black in breeding season, with pale base during non-breeding; legs greenish-grey. Female differs from male in having forehead, crown and mantle mousy brown, rump paler, chin to breast and flanks pale brown, wing brown, inner secondaries paler, secondary coverts buffy white, tail brown with slight mauve gloss. Juvenile is generally grey, back brownish, lacks nape patch. Voice. Song a varied mix of whistles, trills and chatters, including some mimicry. Calls include loud crackling sounds, also soft "prrp" flight call; grating buzz followed by short sharp yap, "grzzz-kwip", noted in Korea.
Habitat. Breeds in forest steppe, mixed forest, forest clearings, riparian woodland and villages, mainly in lowlands. On passage and in in non-breeding range occurs in woodland edge, secondary growth, coastal vegetation, cultivation, fallow lands, gardens and parks.
Food and Feeding. Diet primarily insects; also earthworms (Oligochaeta) and fruit, some seeds including arillate seeds of acacias. Insect food includes moths and caterpillars (Lepidoptera), flies (Diptera), and locusts and other grasshoppers (Orthoptera), alate termites (Isoptera); fruit such as *Fagraea fragrans*, *Sambucus latipinna*, *Ficus*. Forages on ground, by probing, also hawks insects in air; also gleans from leaves and flowers. In pairs and small groups when breeding; in non-breeding season gregarious, in small to large flocks, often with *Aplonis panayensis*; flocks of more than 150 individuals noted in Java in Nov and Jan. In winter communal roosts in reedbeds and trees, in Singapore together with *Acridotheres tristis*, *Acridotheres javanicus* and *Aplonis panayensis*, but tends to segregate with conspecifics.
Breeding. Breeds May–Jun in Russia and Korea. Monogamous. Solitary, nests normally 50–80 m apart. Nest built by both sexes, from dry grasses, sedges, leaves, roots and paper, sometimes sparsely lined with feathers, placed 3–10 m above ground in hole, usually in tree, including old hole of White-backed Woodpecker (*Dendrocopos leucotos*), or in wall of house or other building; accepts nestboxes. Clutch 3–7 eggs, normally 5–6, eggs various shades of blue; incubation of eggs and feeding of chicks done by both sexes, no information on duration of incubation and nestling periods. Nest sometimes parasitized by *Poliopsar cineraceus*.
Movements. Migratory, arriving in N breeding areas in May, leaving Russia in late Jul and Korea in Sept–Oct. Local winter visitor in C & S Thailand, Peninsular Malaysia and Singapore, and in Sumatra and Java; present in Singapore Oct–Apr. Recorded widely on passage through much of China and SE Asia. Vagrants recorded in N & S Indian Subcontinent, also Andaman Is and Nicobar Is.
Status and Conservation. Not globally threatened. Fairly common to uncommon in breeding range. Rather local in much of non-breeding range, but not uncommon in Singapore. In Korea encouraged to nest in forests through provision of nestboxes, as considered beneficial in controlling insect pests. Roost-sites in Singapore sometimes regarded as a problem, but they contain small numbers of present species compared with those of other sturnid species.
Bibliography. Abdulali (1967), Brazil (1990), Chen Fuguan *et al.* (1998), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Étchécopar & Hüe (1983), Hails (1987), Higgins *et al.* (2006b), Hoogerwerf & Rengers Hora Siccama (1938), van Marle & Voous (1988), Medway & Wells (1976), Rasmussen & Anderton (2005b), Roberts (1992), Robson (2000), Stepanyan (2003), Tomek (2002), Wells (2007), Winter & Sokolov (1983), Won Pyong-Oh (1961a, 1961b), Won Pyong-Oh & Woo Han-Chung (1957).

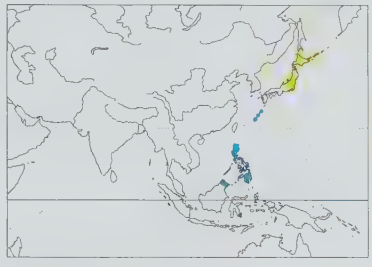
50. **Red-cheeked Starling**

Agropsar philippensis

French: Étourneau à joues marron **German**: Violettrückenstar **Spanish**: Estornino Carirrojo

Other common names: Violet-backed/Chestnut-cheeked Starling, Japanese Small Starling, Red-cheeked Myna

Taxonomy. *Motacilla Philippensis* J. R. Forster, 1781, Philippines.
Genus often subsumed into *Sturnus*; alternatively into *Sturnia*. May form a superspecies with *A. sturninus*. Monotypic.
Distribution. Breeds on S Sakhalin, Japan (S, including offshore islands of Rishiri-to, Teuri-jima and Sado, to C Honshu), S Kuril Is (S from Iturup), and Askold I (off Vladivostok, in SE Russia); non-breeding Ryukyu Is, Philippines and N Borneo.



Descriptive notes. 17 cm; c. 50 g. Small starling with short tail. Male has forehead and crown buffy white, mantle and back glossy violet; rump pale salmon with some purple feathers, sometimes all purple; wing dark brown with glossy green on remiges, outer secondaries white at base, median coverts white (prominent wingbar); tail black with green gloss, outer web of outer rectrix pale salmon; chin white with orange suffusion, throat white; cheek and side of neck brick-red, this colour sometimes extending onto upper breast; breast and flanks pale grey, belly whitish, shading to buffy salmon on lower belly and undertail-coverts; iris dark brown; bill grey or blackish; legs olive-green or bluish-horn. Female is duller than male, lacks red on cheek, has crown and back buffy grey, rump ochre, underparts buffy white; wing dark brown, gloss on outer webs of remiges, pale edges of outer secondaries, white tips of median wing-coverts (narrower bar on closed wing), tail dark brown. Juvenile apparently undescribed. Voice. Song described as babbling interspersed with louder calls; may include mimicry. Adults give excited "airr" calls; alarm "tschick", flight call a melodious "chrueruchu"; young in nest emit "tsirr" or "tsieee" chirps.
Habitat. During breeding season, found in open mixed deciduous woodland, agricultural land, and parks and villages, mainly in lowlands; on Honshu at 800–1500 m, perhaps because *Poliopsar cineraceus* common in lowlands; forest and higher mountains avoided. Open country and cities during non-breeding season.
Food and Feeding. Takes insects and fruit. Few details on diet of adults within breeding range; on migration feeds on fruit of *Ficus religiosa*, *Morus* and *Actinophloeus macarthur*, and nectar of *Spathodea campanulata*. Nestlings fed primarily with insects, particularly caterpillars and adult butterflies (Lepidoptera), dragonflies (Odonata), adult craneflies (Tipulidae), also ants, bees and ichneumon flies (Hymenoptera), beetles and their larvae (Coleoptera), flies (Diptera), grasshoppers and bush-crickets (Orthoptera), and shield-bugs (Heteroptera); cocoons of spiders (Araneae) and fruit of cherries (*Prunus*). Forages in treetops, by gleaning insects; diet indicates that some prey also collected on the ground. In pairs and small groups; in larger flocks in non-breeding season, and sometimes huge gatherings just before and during migration.
Breeding. Season May–Jul; date of first egg-laying on Honshu now 7 days earlier than it was 25 years ago. Monogamous. Nest in hole in tree or man-made structure, including building and nestbox, cavity sometimes without nesting material, or both sexes contribute material but male does most of building work (and may sing while holding green leaves in bill); male may continue to add green leaves during incubation and nestling periods. Clutch usually 5 eggs, later clutches smaller, progressive increase in mean clutch size on Honshu over past 25 years; eggs azure blue; incubation mainly by female, period 10–14 days; chicks fed by both parents, both bill to bill and by regurgitation, nestling period 15–22 days, typically 18 days; adults continue to feed fledged young for some days. In two studies, respectively 45% and 47% of eggs produced fledglings; in latter case, mortality from starvation and predation by blue-green snakes (*Elaphe climacophora*).
Movements. Migratory. Arrival in S Japan in late Mar, moving N to breeding grounds Apr–May; arrival Kuril Is and Sakhalin mid-May, older birds preceding yearlings. Leaves breeding areas Aug–Oct; in Kyushu hundreds of thousands of individuals assemble prior to flying S; passage recorded Korea, along E China coast and Taiwan. Non-breeding grounds in Ryukyu Is, but mainly Philippines (recorded Oct–Apr) and Borneo (Sept–Apr). Vagrant in Hong Kong, N Sulawesi region and N Moluccas.
Status and Conservation. Not globally threatened. Scarce on Sakhlin and Kuril Is; fairly common in Japan, but numbers appear to have declined in Tokyo area of Honshu. Relatively small numbers reported in non-breeding quarters, e.g. uncommon in Philippines, suggesting that main wintering areas have perhaps not yet been discovered.
Bibliography. Brazil (1990), Chalmers (1986), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1987), Dementiev *et al.* (1954, 1970), Dickinson *et al.* (1991), Haneda & Ushiyama (1967), Jahn (1942), Kennedy *et al.* (2000), Kidd (1978), Koike (1988), Koike & Higuchi (2002), duPont (1971), Robson (2000), Smythies (1986), Tomek (2002), Thiede & Thiede (1971), Wells (2007), White & Bruce (1986).


inches 4
cm 10
♀
♂
51
ssp nemoricola
♂
ssp malabarica
♂
52
♀
ssp blythii
♂
ssp erythropygia
53
ssp andamanensis
54
55
58
56
57
59
ssp mahrattensis
60
ssp fuscus
ssp melanosternus
61
62
63
ssp tertius
65
ssp melanopterus
64
ssp burmannicus
ssp tristis

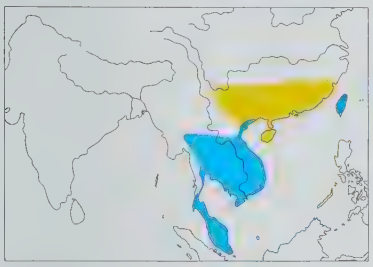
Genus *STURNIA* Lesson, 1837

51. White-shouldered Starling

Sturnia sinensis

French: Étourneau mandarin **German**: Mandarinstar **Spanish**: Estornino Chino
Other common names: Chinese/Grey-backed Starling

Taxonomy. *Oriolus sinensis* J. F. Gmelin, 1788, China.
Genus often subsumed into *Sturnus*. Monotypic.
Distribution. Breeds SE China (S of a line from E Yunnan E to Fujian, including Hong Kong and Hainan I) and NE & NC Vietnam; non-breeding Hong Kong, Taiwan, and from S Myanmar and Thailand E to Indochina, S to Malay Peninsula.



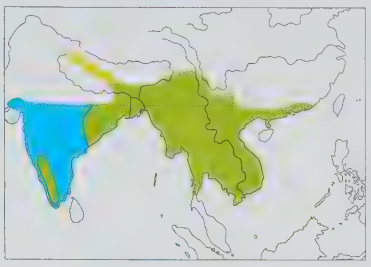
Descriptive notes. 17 cm; 61 g. Male has forehead buffy white, crown buffy white or pale grey; nape, mantle and back silver-grey, rump buffy ochre; wing dark brown to black, slight green gloss on secondaries, upperwing-coverts and scapulars white, forming large white shoulder patch; tail black with some gloss, rectrices with white or buff tips, broader on outer feathers (pale tips can be completely abraded in worn plumage); some regional variability, rectrices may be tipped with cinnamon (tail resembling that of *S. malabarica*); chin and throat buff, cheek grey-brown; breast buffy grey, belly and undertail-coverts ochreous; iris silver or white; bill blue-grey; legs grey. Female is similar to male but generally greyer, with less evident contrast, rump little paler than back, rectrices tipped dirty buff. Juvenile is like female but plumage is somewhat browner, lacks white in wing, and has scapulars grey, wing-coverts blackish, bill duller. Voice. Song apparently not described. Flight call is a soft "preep", alarm is a harsh "kaar".
Habitat. Open country, including scrub and settled areas, cultivation; lowlands, in non-breeding quarters to 400 m.
Food and Feeding. Diet includes insects, but no data from breeding range. Largely arboreal when breeding. On non-breeding grounds seen to forage on ground among cattle, and to glean leaves and twigs of trees; also takes figs (*Ficus*). Gregarious; associates with *Aplonis panayensis* and *Agropsar sturninus* on Malay Peninsula.
Breeding. Mar–Jun in Vietnam. Often in colonies, and with other species. Nest a large mass of vegetation, placed in hole in tree, rock or building, e.g. pagoda. Clutch 4 eggs, plain blue-green. No other information.
Movements. Migratory in most of range; resident in Hong Kong and N Vietnam. Post-breeding movement S to SE Asia (sometimes as far S as Singapore) and Taiwan. Accidental in Japan, Korea, Borneo and Philippines.
Status and Conservation. Not globally threatened. Rather uncommon. In China, population has recently declined markedly in numbers; locally common in Vietnam. In non-breeding quarters scarce to quite common.
Bibliography. Brazil (1990), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1987), Dickinson *et al.* (1991), Étchécopar & Hüe (1983), Harrison & Smythies (1963), Kennedy *et al.* (2000), King *et al.* (1975), Leven & Corlett (2004), duPont (1971), Rasmussen & Anderton (2005b), Robson (2000), Wells (2007).

52. Chestnut-tailed Starling

Sturnia malabarica

French: Étourneau à tête grise **German**: Graukopfstar **Spanish**: Estornino Malabar
Other common names: Grey-headed/Ashy-headed Starling/Myna; Blyth's/Malabar White-headed Starling/Myna (*blythii*)

Taxonomy. *Turdus malabaricus* J. F. Gmelin, 1789, Malabar coast, India.
Genus often subsumed into *Sturnus*. Distinctive race *blythii* has sometimes been treated as a separate species on basis of plumage, proportions, sexual dimorphism, and vocal differences; claims of intergradation have been disputed. Proposed race *assamica* (described from Naga Hills, in NE India) synonymized with *nemoricola*. Type locality of species falls outside breeding range of nominate race and instead within range of race *blythii*, but in non-breeding season both forms can co-occur in this region; name presumably based on a visiting specimen. Three subspecies currently recognized.
Subspecies and Distribution.
S. m. malabarica (J. F. Gmelin, 1789) – N India (foothills in Himachal Pradesh) E to NE Arunachal Pradesh (Mishmi Hills) and N Assam, S to Orissa; occurs in remainder of peninsula, but status uncertain.
S. m. blythii (Jerdon, 1845) – SW India (from S Maharashtra S to Kerala).
S. m. nemoricola Jerdon, 1862 – NE India (S Assam) E to Myanmar, S China, Thailand and Indochina.
Descriptive notes. 20 cm; 32–44 g. Rather small starling with elongate and hackled feathers on crown, nape and side of face, and throat. Nominate race has forehead and chin white, crown, nape and side of head silver-grey with pale feather shafts (producing streaked appearance); upperparts grey, rump orange-brown; upperwing-coverts grey, tinged brownish, primaries brown, darker and with green gloss on outer webs, primary coverts black with green gloss, secondaries brown, grey margins on outer webs (broader on inner secondaries); tail grey, rectrices tipped chestnut, more broadly on outer feathers, outermost rectrices wholly chestnut; throat cinnamon with white feather shafts (producing streaking); breast, belly and vent rich cinnamon-brown, undertail-coverts variable, often partly or sometimes wholly white; iris greyish-white; bill yellow at tip, green in middle, blue at base; legs brownish-yellow or olive-brown. Sexes alike. Juvenile is grey-brown



above, paler on head, with faint pale supercilium, rusty tinge on uppertail-coverts, dirty buffish-white on side of head and underparts, dark brown wings and tail with paler edges on remiges and wing-coverts, narrow rufous tips on rectrices, iris bluish. Race *nemoricola* is paler than nominate, has head and breast greyer with white streaking, underparts dirty white with rufous less extensive, primary coverts grey or white (forming white patch); *blythii* is distinctive, larger and longer-billed than others, sexually dimorphic, male has brilliant white head and breast, grey rump washed cinnamon, flanks, lower belly and undertail-coverts rufous, primary coverts black, bases of primaries white, female differs from male in having white restricted to forehead, chin and throat, with crown and nape grey with pale streaking, breast greyish, merging into creamy rufous on lower belly and flanks, with undertail-coverts greyer, less rufous, than on male. Voice. Song a series of short hard notes and low squeaky churrs, also rapid subdued outbursts of same notes mixed with some harsher ones and thin wheezy chortles; race *blythii* song more nasal and less harsh. Calls include short buzzes and whistles, flight call disyllabic and metallic; chattering in feeding flocks.
Habitat. Open woodland and areas with scattered trees; often in young forestry plantations, also close to human habitation. Lowlands and foothills, to 2000 m in Indian Subcontinent; to 1500 m in SE Asia.
Food and Feeding. Diet includes insects, fruit, seeds and nectar; possibly also pollen and flower buds. Insects taken include caterpillars (Lepidoptera), beetles (Coleoptera), termites (Isoptera), bees (Hymenoptera), flies (Diptera), bugs (Hemiptera) and earwigs (Dermaptera); seeds of *Albizzia* and *Acacia culiformis*, fruit of *Lantana*, *Zizyphus*, *Pithecelobium dulce* and figs (*Ficus*), nectar from *Butea*, *Bombax*, *Erythrina*, *Grevillea* and *Loranthus*. Nestlings fed mainly with insects, particularly caterpillars and beetles. Highly arboreal, foraging with great agility in fine branches in flowering trees, gleaning insects; forages also in low bushes and occasionally on ground. Pairs or small groups; in larger flocks when feeding on termite alates. Roosts communally in bushes, sometimes with other species such as *Gracupica contra*.
Breeding. Season Apr–Jul in N India and Feb–May in S; Apr–Jun in SE Asia. Monogamous. Nest of grass, rootlets and twigs, placed by both parents in tree hole, often old hole of woodpecker (Picidae) or barbet (Capitonidae), 3–15 m above ground. Clutch 3–5 eggs, plain blue-green; both male and female participate in incubation of eggs and feeding of chicks; no information on duration of incubation and nestling periods.
Movements. Uncertain. Thought to be resident in most areas, but erratic movements reported which may represent local migration. In Indian Subcontinent, a summer visitor to Kathmandu valley, in Nepal, and possibly mainly a non-breeding visitor over much of peninsula; race *blythii* resident in SW India, where often joined by nominate birds during non-breeding period, even occurring in mixed flocks; vagrant in SE Pakistan and Sri Lanka. In Thailand, resident population augmented by numerous immigrants during winter.
Status and Conservation. Not globally threatened. Fairly common through greater part of range in India and SE Asia; *blythii* locally common in SW India. Some evidence of possible range extension into Pakistan in NW.
Bibliography. Amadon (1956), Ali (1932), Ali & Ripley (1972), Chen Fuguan *et al.* (1998), Deignan (1945), Devasahayam & Rema (1991), Feijen & Feijen (2008), Fleming & Traylor (1968), Jaman & Sahreen (2004), Lekagul & Round (1991), Majumdar (1984a), Mason & LeFroy (1912), McCarthy (2006), Narang & Lamba (1982), Rasmussen & Anderton (2005b), Roberts (1992), Robson (2000), Smythies (1986), Wells (2007).

53. White-headed Starling

Sturnia erythropygia

French: Étourneau à tête blanche **German**: Andamanenstar **Spanish**: Estornino Cabeciblanco
Other common names: White-headed Myna, Andaman White-headed Starling

Taxonomy. *Sturnia erythropygia* Blyth, 1846, Nicobar Islands.
Genus often subsumed into *Sturnus*. Three subspecies recognized.
Subspecies and Distribution.
S. e. andamanensis (Tytler, 1867) – Andaman Is.
S. e. erythropygia Blyth, 1846 – Car Nicobar, in N Nicobar Is.
S. e. katchalensis Richmond, 1902 – Katchall I, in C Nicobar Is.



Descriptive notes. 20 cm. Small starling with much white in plumage. Nominate race has head to upper mantle and down to breast dirty white; lower mantle and back grey with purple tinge, rump and uppertail-coverts chestnut; wing black, green gloss on outer webs; tail black with green gloss, feathers with chestnut tips (broader on outer rectrices), outermost feathers almost wholly chestnut; lowermost breast and belly white, undertail-coverts chestnut; iris white, grey or bluish; bill yellow, small blue area at base; legs yellow. Sexes alike. Juvenile has head streaked brown, tawny fringes on wing-coverts. Race *andamensis* is greyer than nominate, with less gloss on wings, has rump grey, uppertail-coverts and vent buffy white, tail lacks chestnut, outer rectrices white; *katchalensis* resembles nominate, but has paler rump and uppertail-coverts (but rufous undertail-coverts). Voice. Song a loud series of disconnected notes of a very great variety of types, including musical notes, mimicry of calls of various other bird species, interminged with snarling and snorting notes, squawks and rattles.
Habitat. Forest clearings, forest edge, secondary woodland and open areas, including grassland and cultivated areas.

On following pages: 54. Brahminy Starling (*Sturnia pagodarum*); 55. White-faced Starling (*Sturnornis albofrontatus*); 56. Great Myna (*Acridotheres grandis*); 57. Crested Myna (*Acridotheres cristatellus*); 58. White-vented Myna (*Acridotheres javanicus*); 59. Pale-bellied Myna (*Acridotheres cinereus*); 60. Jungle Myna (*Acridotheres fuscus*); 61. Collared Myna (*Acridotheres albocinctus*); 62. Bank Myna (*Acridotheres ginginianus*); 63. Common Myna (*Acridotheres tristis*); 64. Vinous-breasted Myna (*Acridotheres burmannicus*); 65. Black-winged Myna (*Acridotheres melanopterus*).

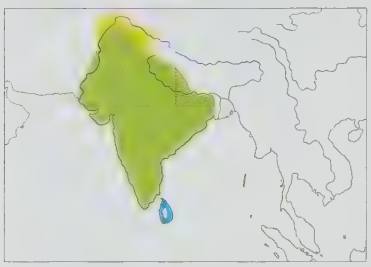
Food and Feeding. Diet includes fruit, nectar and insects. Forages in trees and shrubs; extracts Lepidoptera larvae from rolled bamboo leaves. Gregarious, forms flocks of varying sizes; joins mixed-species flocks of foraging insectivores which include drongos (Dicruridae) and cuckoo-shrikes and minivets (Campephagidae). Flocks roost communally in trees.
Breeding. Season Mar–May. Nest of twigs, lined with green leaves, placed in tree hole 2–10 m above ground. Clutch 4 eggs, uniform blue. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Very common in Andaman Is; less common, but not uncommon, in Nicobars. Apparently not a forest specialist, but is restricted to islands, and could therefore become vulnerable.
Bibliography. Abdulali (1967), Ali & Ripley (1972), Davidar *et al.* (1997), Feare & Craig (1998), Grimmett *et al.* (1998), McCarthy (2006), Rasmussen & Anderton (2005b), Richmond (1902), Tikader (1984).

54. **Brahminy Starling**

Sturnia pagodarum

French: Étourneau des pagodes **German**: Pagodenstar **Spanish**: Estornino de las Pagodas
Other common names: Black-headed/Brahminy/Pagoda Myna

Taxonomy. *Turdus pagodarum* J. F. Gmelin, 1789, Malabar and Coromandel, southern India.
Genus often subsumed into *Sturnus*. Has occasionally been separated in a monospecific genus *Temenuchus*. Monotypic.
Distribution. NE Afghanistan E in foothills to W Nepal and West Bengal, S to E Pakistan and throughout peninsular India; non-breeding Sri Lanka.



Descriptive notes. 20 cm; 40–54 g. Distinctive small starling with long wispy crest formed by elongate and hackled crown feathers; feathers of nape and those of upper breast also hackled. Male has forehead and crown glossy black, nape cinnamon with pale shaft streaks (nape often concealed by long crown feathers); mantle, back and rump grey, tinged brown; upperwing-coverts grey, tinged with brown, primaries dull brownish-black with some white at base; tail grey-brown, all except central feather pair with white tip, white area becoming broader on outer feathers, particularly outer web of outermost feather; side of neck, chin, throat and underparts cinnamon, feathers of upper breast with pale shafts (streaked effect), flanks greyer; iris pale greenish, small bare patch of whitish skin behind eye; bill yellow distally, bluish basally, often with some dull greenish in between; legs lemon-yellow. Female is very like male, but crest shorter, hackles shorter, mantle darker. Juvenile is duller and browner on back, has crown brown without crest or hackles, underparts buffier, iris grey, bill lacks blue at base, legs flesh-coloured. Voice. Song includes huge variety of different notes and mimicry of other species, also repeated short phrases, each verse often introduced with a nasal slurr, given from perch and from ground (in different contexts); loud territorial song in short phrases, a softer advertising song, and extended song with complicated structure given by both members of pair during courtship. Calls include a series of rapidly repeated harsh shrieks, sometimes preceded by nasal note; alarm call a grating "churr", repeated in short series.
Habitat. Open deciduous forest, scrub, and cultivated areas near human habitation; especially fond of waterlogged areas. Lowlands and hills, to 1800 m.
Food and Feeding. Diet insects and other invertebrates, fruit and berries, flowers and nectar. Adults take spiders (Araneae) and snails (Gastropoda), as well as insects such as grasshoppers, crickets and mole-crickets (Orthoptera), earwigs (Dermaptera), cockroaches (Blattodea), termites (Isoptera), bugs (Hemiptera), butterflies and moths and their caterpillars (Lepidoptera), flies (Diptera), ants and bees (Hymenoptera) and beetles (Coleoptera). Fruit and berries of various shrubs and trees, including figs (*Ficus*), *Lantana camara*, *Salvadora persica*, *Salvadora oleoides*, *Zizyphus*, *Bridelia*, *Litsea*, *Mimusops hexandra*, *Thevetia neriifolia* and *Syzygium*. Nectar taken from flowers of *Erythrina*, *Bombax*, *Butea* and *Capparis* (brush-like tip of tongue suggests adaptation for nectarivory); also eat flower parts of *Madhuca indica*, *Butea* and *Grevillea*. Nestlings fed mainly with animal food, especially insects such as termites, moths, grasshoppers, also beetles, flies, bugs, ants, bees and wasps, earwigs, cockroaches; also spiders (Araneae), millipedes (Diplopoda) and earthworms (Annelida); some plant matter, including seeds and pulp of *Azadirachta indica*, *Lantana camara*, *Luffa cylindica*, *Ficus* and leaves of *Peltoforum pterocarpum*, fed to young. Forages extensively on ground, especially among cattle in moist grassland, walking rather than hopping; feeds also in small groups in flowering and fruiting trees, and hunts insects in canopy. Often forages in association with other starlings such as *S. malabarica* in trees, and with *Gracupica contra*, *Acridotheres fuscus* and *Acridotheres tristis* on the ground. Roosts communally in trees and shrubs or in reedbeds.
Breeding. Season Feb/Mar–Aug/Sept, mainly Apr–Aug, generally earlier in S of range than in N; breeding condition of males strongly influenced by photoperiod; second broods common, and sometimes three broods reared in a season. Monogamous. Solitary; also colonial where sufficient nest-holes available. Nest built by both sexes, an untidy structure of dry grass, dead leaves, paper and other material, lined with finer material, placed in hole in tree, often one made by woodpecker (Picidae) or barbet (Capitonidae), or nest of tit (Paridae) nest taken over, or sometimes hole in wall or roof of building used, or nestbox accepted. Clutch 3–5 eggs, generally 4, eggs pale blue; incubation by both sexes, female playing greater role, male reported as feeding female on nest, incubation period 12 days; chicks fed by both parents, nestling period 18–21 days. Hatching success 91–95% over four years, overall nesting success 67%.
Movements. Presumed resident over most of range. In N, summer migrant, arriving in Apr–May in Afghanistan and Kashmir E to N India. Seasonal movements, as in Goa, may be associated with the monsoon. Non-breeding visitor in Sri Lanka. Reported vagrants in SW Myanmar, S Thailand, Singapore and S China (Yunnan) possibly escaped cagebirds.
Status and Conservation. Not globally threatened. Locally common, and may be expanding its range in N. A few scattered reports from NE India and Bangladesh; corroborating reports required. Claims of former breeding in Sri Lanka questioned; now a rare and mainly coastal non-breeding visitor there. Kept as cagebird in India.
Bibliography. Akhtar (1990), Ali (1932), Ali & Ripley (1972), Bhardwaj & Kumar (2004), Chen Fuguan *et al.* (1998), Cheng Tsohsin (1987), Fleming & Traylor (1968), Henry (1971), Kotagama & Fernando (1994), Kumar & Kumar (1991), Legge (1880), Lekagul & Round (1991), Majumdar (1984a, 1984b), McCarthy (2006), Naik & Naik (1969), Narang & Lamba (1984), Patel *et al.* (1992), Raju & Rao (2004), Rasmussen & Anderton (2005b), Roberts (1992), Robson (2000), Stuart Baker (1926), Tyagi & Lamba (1984), Wells (2007).

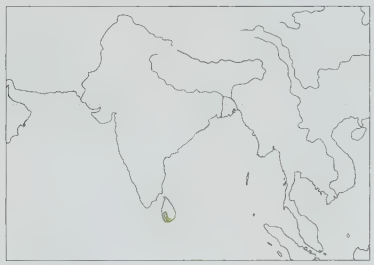
Genus *STURNORNIS* Legge, 1879

55. **White-faced Starling**

Sturnornis albofrontatus

French: Étourneau de Ceylan **German**: Greisenstar **Spanish**: Estornino Cingalés
Other common names: (Ceylon) White-headed Myna/Starling, Ceylon Starling

Taxonomy. *Heterornis albofrontata* E. L. Layard, 1854, Sri Lanka.
Genus often subsumed into *Sturnus*; alternatively, on occasion, into *Sturnia*. Species was until recently referred to as *Sturnus senex*, but that name is not applicable, as type specimen is a misidentified subadult of *Poliopsar sericeus*. Monotypic.
Distribution. SW Sri Lanka.



Descriptive notes. 20 cm. Smallish starling with pied plumage, feathers of crown, nape and upper mantle elongate and hackled. Has forehead, side of head, throat and chin white (sometimes tinged grey); crown, nape and upper mantle dull grey-black, feathers with white shafts (producing white streaking); rest of upperparts, including upperwing and tail, black with slight greenish gloss; breast, upper belly and flanks brownish-grey, tinged with lavender, feathers white-shafted (producing streaking), lower belly and undertail-coverts dirty white; iris brown with grey outer ring, or white with red-brown inner ring, or white; sometimes bluish bare skin around eye; bill greyish-green to horn, base blue-grey; legs lead-grey. Sexes alike. Juvenile is browner above than adult, has indistinct dark eyestripe, greyer below, lacks white streaking on breast. Voice. Song described as soft and sweet. Calls reported include sharp, high, downslurred "cheéwp" with strong emphasis at end, transcribed also as "cheow"; "chirp" also reported.
Habitat. Undisturbed rainforest; also visits fruiting trees in adjacent areas and in villages within forest. From c. 400 m to 1220 m, mostly below 1000 m.
Food and Feeding. Diet mainly fruit; also takes nectar and insects. Recorded items are berries of *Cinnamomum* and fruit of figs (*Ficus*), and nectar from *Bombax* and *Grevillea*. Arboreal; forages in forest canopy. In pairs and in small groups; often in large mixed-species flocks.
Breeding. Season Apr–Aug. Nest in tree hole; either no nesting material or female places a few twigs in hole. One recorded clutch, of 2 pale blue eggs. No other information.
Movements. Presumed resident; may cover long distances between feeding and roosting areas.
Status and Conservation. VULNERABLE. Rare. Has very small global range, confined to wet zone of SW Sri Lanka; estimated total population fewer than 10,000 individuals and declining; population and habitat severely fragmented as a result of degradation and clearance of humid forest. As a canopy-dwelling species, it has suffered severely from the effects of selective logging. Legally protected and present in several national parks and forest reserves, notably Sinharaja National Heritage Wilderness Area.
Bibliography. Ali & Ripley (1972), Anon. (2008b), Butchart & Stattersfield (2004), Collar *et al.* (2001), Feare & Craig (1998), Grimmett *et al.* (1998), Henry (1971), Legge (1880), Mees (1997), Rasmussen & Anderton (2005b), Stattersfield & Capper (2000), Wait (1925).

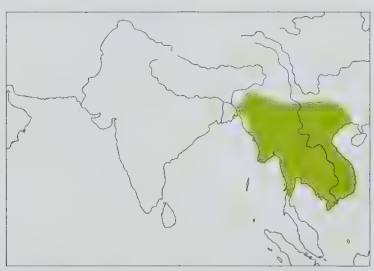
Genus *ACRIDOTHERES* Vieillot, 1816

56. **Great Myna**

Acridotheres grandis

French: Grand Martin **German**: Langschopfmaina **Spanish**: Miná Grande
Other common names: Buffalo Myna, Thai Crested Myna, Orange-billed Jungle Myna

Taxonomy. *Acridotheres grandis* F. Moore, 1858, Sumatra; error = Bangkok, Thailand.
May form a superspecies with *A. javanicus* and often considered conspecific; has also been considered conspecific with *A. fuscus*. Proposed race *infuscatus* (described from lower R Chindwin, in W Myanmar) regarded as inseparable from individuals in rest of species' range. Monotypic.
Distribution. NE India (S Assam, Nagaland and Manipur) and SE Bangladesh E to Myanmar and S China (W & S Yunnan, SW Guangxi), S to N peninsular Thailand and Indochina.



Descriptive notes. 25 cm; 95–103 g. Black myna with forehead feathers elongated, forming frontal crest that may curl backwards; feathers of crown and nape elongate and hackled. Plumage is black, with some gloss on back and wings; white bases of primaries and most of exposed primary coverts, forming distinctive wing patch; white tips of rectrices, broadest on outer feathers; white undertail-coverts; iris reddish-brown; bill chrome-yellow; legs yellow. Sexes alike. Juvenile is duller and browner than adult, with very short frontal crest, buffish-white bases of chin and throat feathers producing spotted appearance, buffy undertail-coverts, wing patch smaller and white tips of rectrices narrower. Voice. Song a jumble of repeated phrases, described as a repetitive "queeter, queeter". Alarm call a harsh "kaar", flight call a soft "piu", contact call a high-pitched disyllabic "chuur-chuur".
Habitat. Open country, such as grasslands and marshes, including cultivated areas and rice paddies, also parks and gardens. Lowlands and foothills, to 1520 m.
Food and Feeding. Diet mainly insects, including alate termites (Isoptera), and other invertebrates; also seeds (rice) and berries. Forages on the ground, extracting insects from grass sward by open-

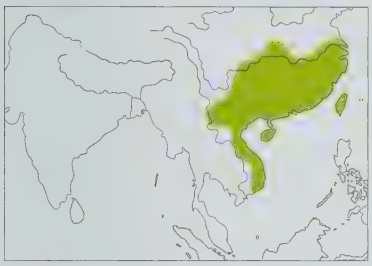
bill probing; gleans insects from leaves. Uses both cattle and buffalo (*Bubalus*) as beaters, catching insects disturbed by the mammals; also removes insects and ticks (Ixodidae) from buffalo. Forages mostly in pairs; also in flocks.
Breeding. Season Apr–Aug. Nest and untidy structure of grass and similar material, placed in hole 5 m or higher in tree, or in crown of coconut palm (*Cocos nucifera*), in house roof or in drainage hole in wall; also in disused bee-eater (Meropidae) burrows on Malay Peninsula. Clutch 4–6 deep blue eggs. No other information.
Movements. Apparently resident.
Status and Conservation. Not globally threatened. Locally common in NE India; common in SE Asia. Generally widespread in modified habitats and tolerant of people. May be expanding S in Malay Peninsula.
Bibliography. Amadon (1956), Ali & Ripley (1972), Chen Fuguan *et al.* (1998), Choudhury (1991, 2005), Deignan (1945), Feare & Craig (1998), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Smythies (1986), Wells (2007).

57. Crested Myna

Acridotheres cristatellus

French: Martin huppé **German**: Haubenmaina **Spanish**: Miná Crestado
Other common names: Chinese Crested Myna, Chinese Jungle Myna, Tufted Myna, Chinese Starling

Taxonomy. *Gracula cristatella* Linnaeus, 1766, China.
Three subspecies recognized.
Subspecies and Distribution.
A. c. cristatellus (Linnaeus, 1766) – S & SE China (S from S Shaanxi).
A. c. brevipennis E. J. O. Hartert, 1910 – C & S Laos and Vietnam (except S), and Hainan I (S China).
A. c. formosanus (E. J. O. Hartert, 1912) – Taiwan.
Introduced (probably race *brevipennis*) in Peninsular Malaysia (Penang), Singapore, N Philippines (Manila region of Luzon), NW Borneo, Japan, Canada (Vancouver), Argentina (Buenos Aires province) and Portugal (Lisbon and Setubal).



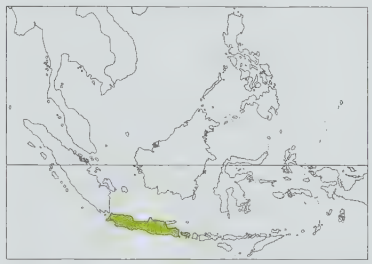
Descriptive notes. 25 cm; 108–140 g. Mostly black myna with elongated forehead feathers directed towards mid-line, forming obvious frontal crest; crown and nape feathers hackled. Nominate race has head and body black, glossy on upperparts, dull on underparts; wing brownish-black, all primaries with broad white bases (conspicuous wing patch); tail black, rectrices with narrow white tips; black undertail-coverts have white tips when plumage fresh; iris yellow to orange, sometimes yellow with orange to red outer ring; bill ivory-white with pale pink wash on base of lower mandible; legs yellow. Sexes alike. Juvenile is browner than adult, with smaller frontal crest and narrower terminal band on tail, iris bluish. Race *brevipennis* is very like nominate, but has narrower forehead feathers; *formosanus* is smaller, with green sheen on crown and back, notably longer frontal crest, sometimes broader white tips on undertail-coverts, bill greenish-yellow. Voice. Commonest vocalization a trisyllabic call with downward inflection (sometimes upward inflection), often repeated; trilling flight call and harsh "jaaay" alarm call; also croaking calls. Song a repetition of tuneless notes. Vocalizations very similar to those of *Acridotheres tristis*, but perhaps with more whistled quality. Mimics other species, in Canada (introduced) including Red-winged Blackbird (*Agelaius phoeniceus*); captives mimic human speech and other sounds in their environment.
Habitat. Open country, including rice paddies and other cultivated areas, also regularly in suburban parks and gardens; avoids woodland. Lowlands.
Food and Feeding. Diet insects and other invertebrates; also fruit, and will scavenge dead fish and human discards. Insects taken include caterpillars (Lepidoptera), cranefly larvae (Tipulidae), winged ants and ant larvae (Formicidae) and flies (Diptera). Fruits include those of *Ficus retusa*, *Lantana camara*, *Cordia cylindristachus* and *Sapium sebiferum*; in Canada (introduced population) cherry (*Prunus*), mountain ash (*Sorbus*), salmonberry (*Rubus spectabilis*), thimbleberry (*Rubus parviflorus*), black raspberry (*Rubus leucodermis*), currant (*Ribes*), crab apple (*Malus*), *Cotoneaster*, bog cranberry (*Vaccinium oxycoccos*). In S China diet 55% animal food and 45% vegetable matter; in Canada c. 60% fruits and berries, 40% insects and earthworms (Oligochaeta). Feeds extensively by probing in grass mat; also gleans insects from vegetation and hawks flying prey. Perches on backs of buffalo (*Bubalus*), from where it will collect and hawk insects. Once seen to harass a nestling Chinese Pond Heron (*Ardeola bacchus*) until latter regurgitated food. In pairs and threes; also in flocks, sometimes fairly large ones. Large nocturnal roosts formed.
Breeding. Season Apr–Aug, from Mar in Taiwan, Apr-May in Philippines; sometimes double-brooded. Monogamous, probably with long-term pair-bond. Colonial breeder where sufficient holes available. Nest an untidy mass of straw, dry grass, pine needles, feathers, wool, paper and other material, in SE Asia often sloughed snakeskins included, in Canada (introduced population) green leaves also reported, placed in natural hole in tree or in rock face, in disused nest of kingfisher (Alcedinidae), of Common Magpie (*Pica pica*) or of *Gracupica nigricollis*, or in hole in man-made structure; nestbox also accepted. Clutch 4–7 eggs, mean 4 in China, 4·8 in Canada; eggs pale blue or blue-green, rarely white; incubation by both adults, period 14 days; chicks fed by both parents, both also remove faecal pellets, nestling period 21 days. In one two-year study of introduced population in Vancouver (Canada), hatching success only 35–40%, but 79–87% of chicks fledged successfully; in later study of same population, 60% hatching success and 46% fledging success; some nest-sites were used for more than ten years.
Movements. Resident, with some dispersal.
Status and Conservation. Not globally threatened. Common to locally very common in much of native range; uncommon to common to Vietnam and Laos. Nominate race has been recorded in E Myanmar, but status there not known. Several successful introductions. Canadian population introduced in 1890s, and by 1920s estimated at 20,000 individuals, spreading S to Washington, in NW USA, but by 1950s population decreased to 2000–3000 and restricted to Vancouver area, where numbers fluctuated until, by mid-1990s, fewer than 100 individuals noted in some years; by 2003 this population considered extinct. Suggested that, being a tropical species, it followed an intermittent incubation pattern, with eggs covered for less than 50% of the time; breeding success markedly lower in cold summers. Factors in decline may have included urbanization of former agricultural land where the birds fed, reduction in nest-site availability through remodelling of older homes, increased cat predation, and decrease in urban roosting sites. This myna was first reported in Argentina in 1982, and apparently increased in numbers, with flocks of more than 100 individuals reported by 1995. In Peninsular Malaysia, population derived from introduced or escaped birds on Penang I, where still reasonably common; after initial success in Singapore, declined and has now apparently disappeared as a breeding species there. Still categorized as an invasive alien in Philippines and Malaysia, where regarded by some people as a crop pest. Feral birds in Japan restricted to Tokyo area. In Europe, escaped individuals of this species were breeding in Lisbon and Setubal regions of Portugal in 2008; a short-lived breeding group was present in Graz, in Austria, from 1983 to 1991.
Bibliography. Chen Fuguan *et al.* (1998), Chiurla & Martinez (1995), Dickinson *et al.* (1991), Hagemeijer & Blair (1997), Hails (1987), Johnson & Campbell (1995), Johnson & Cowan (1974), Kennedy *et al.* (2000), Leader (1995), Leven & Corlett (2004), Lever (2005), Mackay & Hughes (1963), McCarthy (2006), Nguyen-Clausen (1975), duPont (1971), Restall (1968b), Robson (2000), Vaughan & Jones (1913), Wells (2007), Yap & Sodhi (2004).

58. White-vented Myna

Acridotheres javanicus

French: Martin de Java **German**: Javamaina **Spanish**: Miná de Java
Other common names: Javan Myna

Taxonomy. *Acridotheres javanicus* Cabanis, 1851, Java.
May form a superspecies with *A. grandis* and often considered conspecific. Has also been considered conspecific with *A. cinereus*, and both previously included in *A. fuscus*. Monotypic.
Distribution. Java and Bali. Introduced to Taiwan, SE Thailand, Singapore, Sumatra, Lesser Sundas and Puerto Rico, and perhaps Japan.



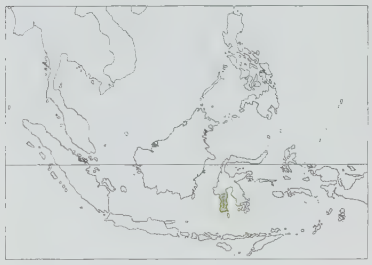
Descriptive notes. 21 cm; 100 g. A typical blackish myna with prominent frontal crest and elongated crown feathers. Head is black, forehead, crown and ear-coverts slightly glossed; upperparts ashy black; wing brownish-black, white bases of primary feathers (least extensive on outermost primary); tail black, rectrices with white tips (broadest on outer feathers); underparts slaty-coloured, undertail-coverts white; iris pale lemon-yellow; bill and legs orange-yellow. Sexes alike. Juvenile is generally browner than adult, unglossed, with frontal tuft and crown feathers shorter, white bases of primaries and white tips of rectrices narrower, underparts paler, and pale feather margins below may produce streaked effect. Voice. Calls very like those of *A. tristis*, but with practice distinguishable to human ear.
Habitat. Cultivated areas and cities; attracted to flooded grassy areas, especially playing fields and airfields.
Food and Feeding. Omnivorous; diet includes fruit, nectar, insects and other animal matter, human refuse. Fruits of *Compnospermum auriculatum*, *Endospermum malaccense*, figs (*Ficus*) and cultivated papaya (*Carica papaya*) and banana (*Musa*) eaten; ovules from cones of *Casuarina* and nectar from *Erythrina* trees also taken. Invertebrate food includes flying ants (Formicidae), termites (Isoptera), fly maggots (Diptera), small crabs (Decapoda), earthworms (Annelida). Human refuse taken from bins or rubbish tips; will feed on carrion from roadkills and on dead animals washed ashore. Captive individuals ingested whole fruits and defecated intact seeds 2–3 hours later, suggesting important role in seed dispersal. Forages primarily on ground, occasionally in trees. In pairs and in small to medium-sized groups; occasionally in larger flocks where food abundant. Large groups assemble in tree roosts, which may be shared with *A. tristis*, also sometimes with *Aplonis panayensis* and *Agropsar sturninus*, although apparently some segregation of species within roost.
Breeding. Breeds throughout year in man-modified environments with abundant food; breeding recorded Apr–May and Sept in Java prior to 1940. Monogamous. Nest an untidy structure of grasses and similar material, placed in natural hole in tree (up to 10 m above ground), in crown of palm (nest then a mass of grass and palm fronds) or in base of bird's-nest fern (*Asplenum nidus*), or in hole in wall, building, bridge or other man-made structure, including lamppost and even a bus in service. Clutch 2–5 eggs, uniform bluish; in captivity, incubation period 13–14 days. No other information for wild-living birds.
Movements. Resident. Local movements from roost-sites to foraging areas.
Status and Conservation. Not globally threatened. Common and widespread in natural range. Elsewhere, introduced population in Singapore estimated at 168,000 individuals by 2000, and more than 20,000 in Taiwan in 1999. In Singapore in 1980s, individuals tracked by radio-telemetry used several different night roosts, and ranged over an average area of 3 km²; by 2001 there had been a significant population decline, and both total range and home area were significantly smaller. Considered an invasive alien in Singapore and Peninsular Malaysia. In Singapore initially regarded as a shy species of the suburbs, but now bold and tolerant of people; noise from night roosts is main complaint against the species, with droppings a lesser nuisance, but attempts to scare or displace the birds have had only limited success; canopy density of roosting trees and proximity to feeding areas are most important factors determining roost-sites, and thinning of canopy at existing roosts and control of refuse in vicinity can alleviate the problem.
Bibliography. Coates & Bishop (1997), Corlett & Lucas (1989), Hails (1985), Hoogerwerf & Rengers Hora Siccama (1938), Kang Nee (1992), Kang Nee & Yeo (1993), Kang Nee *et al.* (1990), Lever (2005), Lin Rueyshing (2001), van Marle & Voous (1988), Medway & Wells (1976), Peh & Chong Fong Lin (2003), Raffaele (1989), Robson (2000), Shieh Baosen *et al.* (2006), Sontag (1998), Wells (2007), White & Bruce (1986), Yap (2003), Yap & Sodhi (2004), Yap *et al.* (2002).

59. Pale-bellied Myna

Acridotheres cinereus

French: Martin cendré **German**: Fahlbauchmaina **Spanish**: Miná Cenizo

Taxonomy. *Acridotheres cinereus* Bonaparte, 1850, Sulawesi.
Has been treated as conspecific with *A. javanicus*, and both previously included in *A. fuscus*. Monotypic.
Distribution. S peninsula of Sulawesi (S from Ranteapo). Introduced to Kuching, Sarawak (Borneo).
Descriptive notes. 25 cm. A medium-sized, mostly greyish myna with lanceolate feathers of forehead erect and forming crest; crown feathers lanceolate and elongated. Has forehead blackish-



charcoal, crown black and glossy, cheek duller black; hindneck and upperparts grey, paler on rump, where some feathers have white shafts; wing dark brown, primary coverts and bases of primaries white (forming white patch); tail brownish-black, terminal third of outer rectrices white, narrower band on inner rectrices, dark feather shafts prominent; chin and throat to breast ashy grey, becoming paler to buffy grey on belly, white on vent; iris lemon-yellow to brownish-orange; bill yellow, small blue-grey patch at base of lower mandible; legs yellow. Sexes alike. Juvenile undescribed. Voice. Described as unmusical squeaky rattles and whistles.

Habitat. Open areas, including paddyfields, villages and cultivated areas; sea-level to 1500 m.

Food and Feeding. Diet presumably includes insects, also fruit. Often forages on ground among cattle, and perches on backs of these animals. In small groups; also singly and in pairs.

Breeding. Nest in hole in tree. No other information.

Movements. Presumed resident.

Status and Conservation. Not globally threatened. Locally common, but very poorly known. Introduced population in Sarawak reportedly increasing.

Bibliography. Coates & Bishop (1997), Feare & Craig (1998), Gregory-Smith (1997), Grimmett *et al.* (1998), Lever (2005), Vorderman (1898a).

60. **Jungle Myna**

Acridotheres fuscus

French: Martin forestier **German**: Dschungelmaina **Spanish**: Miná de la Jungla

Taxonomy. *Pastor fuscus* Wagler, 1827. East Bengal, India.

Has been considered conspecific with *A. grandis*; previously treated as including *A. javanicus* and *A. cinereus* as races. Four subspecies recognized.

Subspecies and Distribution.

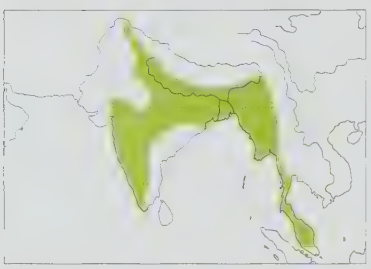
A. f. fuscus (Wagler, 1827) – N Pakistan E through Himalayan foothills to NE India (Assam), S in lower hills to Rajasthan and N Orissa, and to Bangladesh; also Myanmar (except N).

A. f. mahrattensis (Sykes, 1832) – W India from Rajasthan S to Kerala, E to W Tamil Nadu.

A. f. fumidus Ripley, 1950 – E Assam and Nagaland, in NE India.

A. f. torquatus W. R. Davison, 1892 – Malay Peninsula (except extreme S).

Introduced (nominate race) in Fiji; possibly established in Taiwan.



Descriptive notes. 24 cm; 72–98 g. Greyish myna with elongated and hackled forehead feathers directed upwards in mid-line to form short, bristle-like frontal crest; crown and nape feathers elongated and lanceolate. Nominate race has forehead to nape, neck and cheek glossy black; upperparts brownish-charcoal, paler on rump; wing brownish-black, bronze wash on coverts, white bases of primaries covering about half length of inner primaries; tail brownish-black, rectrices tipped white, broader white band on outer feathers; chin, throat and breast slaty grey, belly paler and tinged buff (particularly on lower belly), undertail-coverts white; iris yellow; bill orange, bluish-black base of lower mandible; legs waxy orange. Sexes alike. Juvenile is browner than adult, crown feathers less hackled and less glossy, wings and tail also browner, less distinct white tips on rectrices, browner below, throat pale, breast and belly feathers dark-centred with pale margins, producing streaked effect. Race *mahrattensis* is browner than nominate, with iris bluish-white or grey; *fumidus* is darker, sooty-coloured, with iris yellow; *torquatus* has longer and more glossy crown hackles, darker flanks and belly, off-white undertail-coverts. Voice. Song a loud, hoarse "screeow" repeated in short series; group song of harsh grating rasps rapidly repeated in staccato style, interspersed with or terminating with nasal whistles, weak wheezes, whining sounds and other notes. Common contact call a disyllabic or trisyllabic "tiuck-tiuck", repeated frequently; calls similar to those of *A. tristis*, but higher-pitched.

Habitat. Forest edge and clearings, deciduous woodland near open areas, including cultivated lands, tea plantations, villages and coastal plains; primarily in lowlands and foothills, but to 2000 m in Himalayas. In Fiji (introduced population) primarily in man-modified habitats, occasionally in secondary forest.

Food and Feeding. Diet includes insects, fruit, seeds and nectar. Insect food comprises grasshoppers, mole-crickets and crickets (Orthoptera), termites (Isoptera), beetles (Coleoptera), ants (Formicidae), caterpillars (Lepidoptera), bugs (Hemiptera) and fly larvae (Diptera). Fruits of figs (*Ficus*), *Cordia cylindristachus*, *Lantana camara*, *Capsicum* and *Litsea*; seeds of *Albizia*, *Coriandum*, cloves (*Syzygium*), groundnuts (*Arachis*), as well as cereal grains. Feeds in flowering trees and takes nectar from *Erythrina*, *Bombax*, *Butea*, *Careya* and *Spathodea*; pollen collects on crest, and species is considered an important pollinator of these plants. Also takes household food scraps, and forages at refuse dumps. Forages largely on ground, especially in grasslands grazed by cattle; frequently perches on cattle, and hawks insects disturbed by them. Uses open-bill probing to collect insects in grass. Sometimes feeds in trees and bushes, when food sources abundant there. Commonly in flocks; also in pairs. Roosts communally at night in reedbeds, sugar cane and trees, sometimes with other bird species, including *A. tristis* and *Pastor roseus*. In Fiji (introduced), roosts contain fewer than 30 individuals, and not associated with *A. tristis*.

Breeding. Season Jan–Jul; in India Apr–Jul in N and Feb–May in S; Jan-May in Malaysia; multi-brooded. Monogamous. Colonial breeder when sufficient nest-sites available. Nest a simple structure lined with twigs, roots, feathers and human artefacts, often sloughed snakeskins included, placed in hole in tree, sometimes old hole of woodpecker (Picidae), 2–6 m above ground; artificial structures such as drainage holes in walls also used; holes in limestone cliffs in Malaysia. Clutch 3–6 eggs, turquoise blue; both sexes participate in incubation of eggs and feeding of young; no information on duration of incubation and nestling periods.

Movements. Generally resident; seasonal movements in some regions, such as Nepal. In NE India, race *fumidus* recently recorded in Calcutta (S West Bengal), far W of normal range.

Status and Conservation. Not globally threatened. Locally common in Indian Subcontinent; uncommon to locally common in Myanmar and Malay Peninsula. Was introduced in Fiji deliberately as a means of controlling grasshopper pests in sugar-cane plantations; established on Viti Levu and offshore islands, and recorded on Vanua Levu. Records in Tonga and Samoa presumed to involve vagrants from Fiji; apparent successful colonization of Samoa has raised fears that this species could compete for nest-sites with endemic Blue-crowned Lorikeet (*Vini australis*). In Taiwan, more than 1900 individuals reported in 1999. Considered a pest in parts of range; damages fruit in orchards in India, also causes damage to groundnuts and cloves.

Bibliography. Ali (1932), Ali & Ripley (1972), Beichle & Baumann (2003), Chatterjee *et al.* (2007), Fleming & Traylor (1968), Inskipp & Inskipp (1991), Lekagul & Round (1991), Lever (2005), Lin Rueyshing (2001), McCarthy (2006), Muse & Muse (1982), Narang & Lamba (1984), Raju & Rao (2004), Rasmussen & Anderton (2005b), Roberts (1992), Robson (2000), Watling (1975, 1982), Wells (2007).

61. **Collared Myna**

Acridotheres albocinctus

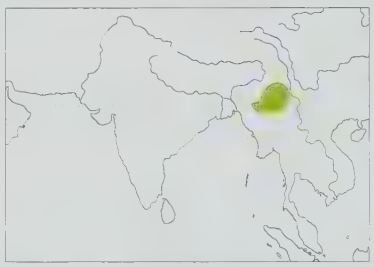
French: Martin à collier **German**: Halsbandmaina **Spanish**: Miná Acollarado

Other common names: White-collared Myna

Taxonomy. *Acridotheres albocinctus* Godwin-Austen and Walden, 1875, Manipur, India.

Monotypic.

Distribution. NE India (Manipur valley), N Myanmar and S China (NW Yunnan).



Descriptive notes. 25 cm. Relatively large, distinctive myna with white collar; feathers of forehead hackled and erect, forming short crest, crown and nape feathers elongated and lanceolate. Head black, slightly glossy, overall glossy grey-black above, slightly paler, duller, greyish-black below; pale collar formed by buffish-white feathers (white when tips abraded) at side of neck and throat, on nape white tips form broken band; black undertail-coverts tipped white, producing barring; wing black, small white wing patch formed by white bases of primaries; tail black, tipped white (white tips are sometimes absent on inner feathers); iris pale blue or azure-blue; bill orange-yellow; legs yellow. Sexes alike. Juvenile is browner than adult, with pale throat and pale patch on side of neck formed by buffy-white feather tips, forehead feathers bristly but no crest. Voice. Apparently undescribed.

Habitat. Open grassland, moist areas, including marshland, and cultivated lands, also villages; generally between 800 m and 1200 m, but to 1525 m in Myanmar.

Food and Feeding. Diet includes animal and plant food: grasshoppers (Acrididae) and other insects, also small vertebrates (frogs, lizards); cereal grains, nectar and fig (*Ficus*) fruits. Forages mostly on ground; also in trees. Associates with cattle and buffalo (*Bubalus*). Gregarious; often in flocks with *A. grandis*.

Breeding. Season Apr–Jun. Colonial. Nest a roughly built structure placed in hole in tree or bank, or in hollow in wall. Clutch 4 eggs, plain blue. No other information.

Movements. Resident. Possibly some small local movements.

Status and Conservation. Not globally threatened. Very local in NE India; uncommon to locally common in Myanmar. Very poorly known. Rare exotic in Taiwan, where presumed to involve escaped captives.

Bibliography. Ali & Ripley (1972), Chen Fuguan *et al.* (1998), Feare & Craig (1998), Grimmett *et al.* (1998), Lin Rueyshing (2001), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Smythies (1986), Stresemann & Heinrich (1940a).

62. **Bank Myna**

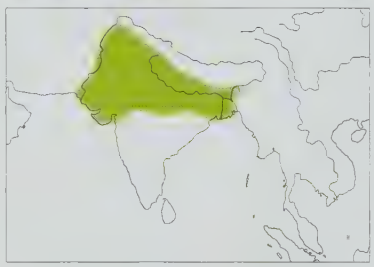
Acridotheres ginginianus

French: Martin des berges **German**: Ufermaina **Spanish**: Miná Ribereño

Taxonomy. *Turdus ginginianus* Latham, 1790, Nadia, West Bengal, India.

Monotypic.

Distribution. N Indian Subcontinent from NC & E Pakistan and Himalayan foothills E to S Nepal and W Assam, S to Sind, NC India (Gujarat, C Madhya Pradesh, West Bengal) and Bangladesh. Introduced to Japan and United Arab Emirates; also reported from Kuwait, Oman and Saudi Arabia.



Descriptive notes. 22 cm; 64–76 g. Smallish myna with forehead feathers bristly and directed to mid-line to form short frontal crest; feathers of crown and nape elongate and lanceolate. Forehead, crown, nape and cheek are glossy black, upperparts grey; upperwing glossy black, green iridescence on secondaries, bases of primaries white, becoming chestnut-brown on inner feathers, chestnut primary coverts; tail glossy black, rectrices with chestnut tips (covering half of outer web of outermost rectrix); chin grey, breast grey with cinnamon tinge, centre of belly and undertail-coverts cinnamon, flanks grey with cinnamon wash; underwing-coverts chestnut (underwing in flight appears banded, with chestnut coverts, white primary bases, and black secondaries and outer part of primaries); iris intense brown-red, bare skin behind and below eye brick-red; bill orange-yellow; legs yellow. Sexes alike. Juvenile is dun-brown above, paler buffy below, wings and tail brown, primary coverts buffy, white bases of primaries and white tips of rectrices narrower than on adult, iris red-brown, bill and bare facial skin dull orange, legs golden-brown. Voice. Song of male includes low croaks, high-pitched whistles and warbles, also some mimicry. Raucous alarm call, and high-pitched scream during mobbing; "wheek" contact or flight call; female gave high-pitched staccato calls after copulation. Voice similar to that of *A. tristis*, but harsh and shriller in tone.

Habitat. Closely associated with man-modified habitats, both agricultural areas and cities. On farmland often found with cattle, and favours wetter areas near irrigation canals and rivers; in cities found at refuse dumps, sewage works, and wherever food likely to be discarded.

Food and Feeding. Omnivorous, diet incorporating animal food, fruit, seeds, and food waste discarded by humans. Animal food includes frog tadpoles, small snails (Gastropoda), earthworms

(Annelida), ticks (Ixodidae), spiders (Araneae), millipedes (Diplopoda), centipedes (Chilopoda), and many insects, e.g. ants and wasps (Hymenoptera), crickets, mole-crickets and grasshoppers (Orthoptera), beetles and their larvae (Coleoptera), butterflies, moths and caterpillars (Lepidoptera), termites (Isoptera), bugs (Hemiptera), cockroaches (Blattodea), earwigs (Dermaptera), mantids (Mantodea), and adult and larval flies (Diptera). Fruits taken include especially those of figs (*Ficus*), also grapes (*Vitis*) and mulberries (*Morus*); also peas (*Pisum*) and chillies (*Capsicum*), as well as *Lantana camara* and *Zizyphus* berries. Occasional visitor to flowering *Erythrina suberosa* trees, feeding on nectar. Nestlings fed with c. 95% animal food, mostly insects. Forages mostly on ground; often follows the plough and accompanies cattle. Settles on cattle and removes ticks from them. Observed to ride on airport catering vehicles. In pairs and flocks. Large communal roosts formed throughout year, in winter often in sugar cane or reedbeds, at other times in tall trees, sometimes on buildings.

Breeding. Season Mar–Aug, primarily Apr–Jun. Monogamous. Colonial. Generally excavates own tunnel in bank of river, tunnel up to 1 m long and ending in broader chamber, which it lines with straw, feathers, pieces of sloughed snakeskin, polythene and other material (in captivity, birds added fresh green leaves regularly and replaced dried leaves); sites such as brick kiln, bridge and well also utilized, and rarely nest placed in stack of sugar cane. Clutch 3–6 eggs, pale blue or greenish turquoise; incubation by both sexes, female doing more, period 13 days; both parents feed chicks and remove faecal material, nestling period 20–22 days.

Movements. Mainly resident; some seasonal or nomadic movements within range.

Status and Conservation. Not globally threatened. Common. An old record from SE Afghanistan (Kandahar), but present status there not known. Rare exotic on Taiwan, but no evidence of breeding. Causes damage locally to ripening sorghum (*Sorghum*), also to grapes and millet (*Pennisetum*); on other hand, considered an important disperser of banyan (*Ficus benghalensis*) seeds. May be beneficial to humans on balance, because it consumes large numbers of insect pests, including larvae of the noctuid moth *Ophiusa melicerte*, a pest of castor-oil plants (*Ricinus communis*), larvae of the noctuid *Helicoverpa armigera*, a pest of Egyptian clover (*Trifolium alexandrinum*), and house flies (*Musca domestica*); may also be a vector of a virus infecting *Helicoverpa*.

Bibliography. Ali & Ripley (1972), Dhindsa (1980), Jior *et al.* (1995), Khera & Kalsi (1986a, 1986b), Lamba (1981), Lever (2005), Lin Rueyshing (2001), McCarthy (2006), Midya & Brahmachary (1991), Naik & Naik (1969), Narang & Lamba (1984), Parasara *et al.* (1990), Raju & Rao (2004), Rasmussen & Anderton (2005b), Rayner (1986), Ripley (1983), Roberts (1992), Schlee (1993), Simwat & Sidhu (1974), Singh *et al.* (1990).

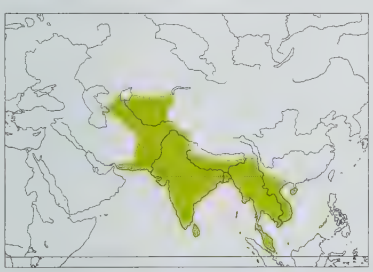
63. Common Myna

Acridotheres tristis

French: Martin triste **German**: Hirtenmaina **Spanish**: Miná Común
Other common names: Indian/House Myna, Locust Starling

Taxonomy. *Paradisea tristis* Linnaeus, 1766, Philippines; error = India.
Races perhaps intergrade to some extent in SW India (Kerala). Two subspecies recognized.

Subspecies and Distribution.
A. t. tristis (Linnaeus, 1766) – Turkmenistan, Uzbekistan, S Kazakhstan and Tajikistan S to SE Iran, Afghanistan and almost entire Indian Subcontinent S from Himalayan foothills (except Sri Lanka), thence E to Myanmar, S China (Yunnan and Hainan), Thailand, Indochina, Malay Peninsula and Singapore.
A. t. melanosternus Legge, 1879 – Sri Lanka.
Introduced (nominate race) in SE USA (Florida), E South Africa, E & SE Australia (except Tasmania), New Zealand (North I), Hong Kong, Brunei, Sumatra, Taiwan, Japan, Saudi Arabia, United Arab Emirates, Iraq, Jordan, Israel; also in Russia, with isolated breeding reported from Moscow area and Trans-Baikal region, and in Kazakhstan (Alma-Ata); established on many oceanic islands in Atlantic (Ascension, St Helena, Tenerife), Pacific (Hawaii, Solomons, Vanuatu, New Caledonia, Fiji, American Samoa, Samoa, and many of the Cook, Society, Tuamotu and Marquesas Groups), Indian Ocean (Madagascar, Comoros, Mascarenes, Seychelles, Agalega, Chagos, Laccadives, Maldives, Andamans and Nicobars).



Descriptive notes. 25 cm; 82–143 g. Fairly large, stocky myna with brown, black and white plumage, short bristly feathers on forehead, feathers of crown and nape elongated and lanceolate. Nominate race has head glossy black, upperparts chestnut-brown; upperwing brownish-black, white primary coverts and bases of primaries; tail brownish-black, white tips of rectrices (broadest on outer feathers); chin, throat and upper breast duller and greyer than back; lower breast and flanks brown with vinous tinge, central belly buff, lower belly and undertail-coverts white; iris brown or reddish-brown, mottled with white, bare skin behind and below eye bright yellow; bill yellow, base of lower mandible greenish; legs yellow. Sexes alike in plumage, male slightly larger than female. Juvenile is duller and browner than adult, has browner head feathers lacking gloss, brownish-black chin to upper breast, pale tips of rectrices narrower and buffish. Race *melanosternus* is darker than nominate, darker brown with rufous tinge on upperparts, darker below, brownish-black feathers extending to belly, white tips of rectrices narrower than in nominate. Voice. Highly vocal at all times; mimics other birds, and captives imitate human speech. Song by both sexes throughout year, but production greatest during breeding; serves for territorial defence and pair formation. Song consists of many notes and combinations, with elements typically repeated, common sequence rendered as "hee hee chirk-a chirk-a chirk-a". Partners may duet, and neighbours can match song types. Cacophonous song also heard at night roosts, especially in morning and evening. Aggressive "chip" calls; flight call a querulous "kwerrh"; high-pitched screams in distress; scolding "chake chake" alarm call against predators, recognized by other mynas and also other species as indicating potential danger; parents may trill when approaching nest, stimulating young to beg.

Habitat. Open country, avoiding forest; dry open woodland, floodplains, grasslands, cultivated areas, villages, towns and cities; to c. 3000 m in Indian Subcontinent and to 1525 m in SE Asia. Introduced populations usually restricted to towns and cities, and areas highly transformed by human habitation, but on oceanic islands also open areas (particularly grass airstrips), secondary growth and coastal mangroves, and in Comoros occasionally enters forest; recorded to 2300 m in Hawaii, but not above 1100 m in Comoro Is.

Food and Feeding. Omnivorous, although insects often predominate in diet (stomach contents of 632 specimens from India held 82% insects by weight). Vertebrate food includes frogs, fish in drying ponds, geckos (Gekkonidae) and other small lizards, eggs and nestlings of birds, and mice (Muridae); carrion taken opportunistically. Invertebrates such as worms (Oligochaeta and Polychaeta), snails (Gastropoda), crustaceans (Decapoda and Amphipoda), ticks (Acarina), spiders (Araneae), centipedes (Chilopoda), millipedes (Diplopoda), and insects of many orders are eaten on occasion; major part of insect food made up by beetles and their larvae (Coleoptera), grasshoppers and crickets (Orthoptera), moths and butterflies and their caterpillars (Lepidoptera), flies and maggots (Diptera), bees, wasps and ants (Hymenoptera), alate termites (Isoptera), and bugs (Hemiptera). Plant food incorporates fruits and seeds of both wild and cultivated plants: *Glochidon*, *Vitex pubescens*, figs (*Ficus*), papaya (*Carica papaya*), dates (*Phoenix*), apple (*Malus*), pear (*Pyrus*), tomato (*Solanum lycopersicum*), strawberry (*Fragaria*), grapes (*Vitis*), guava (*Psidium*), mango (*Mangifera*), breadfruit (*Artocarpus altilis*), jackfruit (*Artocarpus heterophyllus*), maize (*Zea*), wheat and rice; nectar taken from *Sesbania*, *Spathodea*, *Careya*, *Erythrina*, *Butea* and *Bombax*, and in South Africa (introduced) from *Aloe* and *Erythrina* flowers. Nestlings initially fed with insects, and fruit included after c. 10 days. Forages on refuse dumps; collects discarded household scraps. Most foraging is done on ground, where open-bill probing used extensively; runs or flies in pursuit of insects, and follows domestic animals or agricultural machinery. Where introduced in South Africa, forages also with grazing mammals such as Burchell's zebra (*Equus burchellii*), eland (*Taurotragus oryx*), bushbuck (*Tragelaphus scriptus*) and impala (*Aepyceros melampus*). Gleans ectoparasites from cattle and bushbuck, and probably also from other ungulates. Sometimes ascends into trees and bushes, mainly for fruit and nectar, but also collects some insects there. Forages singly and in pairs, occasionally in small groups at abundant food. Communal roosts, usually in trees, can contain tens to thousands of individuals (in at least some cases, partners still roost together within such assemblages); pre-roost assemblies in trees, on ground (especially open areas such as playing fields and airstrips), or on buildings; noisy at roosts until well after nightfall; may roost with other species, particularly other starlings such as *A. javanicus*, *Aplonis panayensis*, *Agropsar sturninus*, *Sturnus vulgaris* and *Pastor roseus*, also with crows (*Corvus*), parakeets (*Psittacula*) and sparrows (*Passer*). Apparent anting activity seen in Malaysia where *Oecophylla* ants active.

Breeding. Season Mar–Aug in C Asia, in most months in Indian Subcontinent (mostly Apr–Jul over much of India; Jan–Mar, May–Jun and sometimes Sept–Nov in Bangladesh), and throughout year in SE Asia; multi-brooded; in introduced range, Sept-Mar in Seychelles, Sept–Jan in South Africa, Oct–Apr in Australia and New Zealand, and Mar–Jul in Hawaii. Monogamous; believed to pair for life. Solitary nester. Nest built by both sexes, taking up to two weeks to complete work, an untidy mass of twigs, grass and leaves, sometimes with animal hair, plastic, paper, cloth, string and other materials, placed up to 40 m above ground in hole or similar cavity; often in natural site such as tree hole or hole in cliff or bank, often utilizing hole made by another animal, sometimes in flowering head of palm tree or densely branched tree; man-made structures, such as house eaves, hole in wall or bridge, drainpipe, lamppost, air vent or abandoned vehicle or machinery, exploited extensively; took over nestboxes intended for Common Barn-owls (*Tyto alba*) in Malaysia. Clutch 4–5 eggs, pale blue, sky blue or greenish-blue; incubation by both sexes, female doing more, and only female incubating at night, period 13–18 days; hatching often asynchronous, and brood reduction may occur; chicks fed by both parents, nestling period 22–27 days; young fed by parents for several weeks after leaving nest. Nests parasitized by Great Spotted Cuckoo (*Clamator glandarius*) in South Africa (where introduced). Hatching success in India 90% and in Thailand 73 %, fledging success for natural populations in Asia 54–76% (from eggs laid), with first broods more successful (75%) than second broods (60%) or third broods (< 40%); in introduced population in Hawaii, hatching success typically less than 50% and fledging success only 22%. Adult recaptured after 7 years in Malaysia.

Movements. Resident throughout range; some local or altitudinal movement recorded. Adults seen to forage 3 km from roost; radio-tracked adults in Singapore flew on average 0·4 km from roost to feeding sites, and occupied home range of only 0·1 km². In introduced range, one ringed individual in South Africa moved 381 km over 12-month period.

Status and Conservation. Not globally threatened. Common to very common and locally abundant in original range; common or very common in many areas where introduced. Populations in S Russia and Turkey may be result of range expansion from C Asia or may have been introduced. Escaped captives commonly encountered in many areas; for example, has been found breeding in the wild in Dunkerque, in N France. City roosts, as in Singapore, responsible for noise pollution and fouling through droppings; thinning of canopy of trees and removing of potential food sources can displace the birds. Deliberate introductions often claimed to be justified as biological control of injurious insects, but benefits generally unclear, and this species has proved to cause damage to commercial fruit, notably grapes, and other crops, including groundnuts (*Arachis*) and cereals. In India considered an important agent in dispersal of seeds of neem tree (*Azadirachta indica*). Many introduced populations expanding, and the control and management of these have become a focus of effort by conservation agencies and other bodies. As this myna preys on nest contents of seabirds on islands, it can have a significant impact at some colonies of e.g. terns (Sternidae) and shearwaters (*Puffinus*); also considered a significant nest predator of St Helena Plover (*Charadrius sanctaehelenae*), an Endangered species of the S Atlantic, and causes disturbance at nests of Seychelles Magpie-robin (*Copsychus sechellarum*), which is Critically Endangered. On Silhouette I, in the Seychelles, a survey in 1996 revealed a significant decrease in present species' numbers since 1978–1979, probably related to a reduction in human population and in areas affected by human activity. Now actively controlled on Aride, numbers also reduced on Frégate I. Aggressive in breeding territory, destroying nests of other birds in vicinity, e.g. Red Fody (*Foudia madagascariensis*) on Madagascar, and may compete with indigenous species for nest-sites, e.g. with Critically Endangered Mauritius Parakeet (*Psittacula eques*) and Endangered Mauritius Kestrel (*Falco punctatus*) on Indian Ocean island of Mauritius, and with indigenous members of starling family on Pacific islands; may have contributed to declines or even extinctions of island endemics also through the introduction of alien parasites and diseases. Both native and introduced populations are hosts to blood parasites *Haemoproteus* and *Plasmodium*. In Hawaii, implicated in spread of invasive exotic plant *Lantana camara*; likely to disperse both *Lantana* and cinnamon in Seychelles.

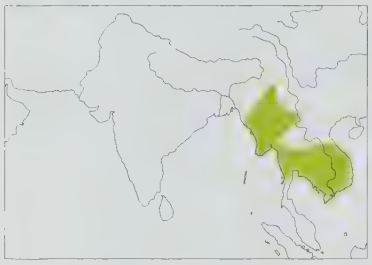
Bibliography. Akhmedov (1957), Ali (1932), Ali & Ripley (1972), Beichle & Baumann (2003), Bennett (1976), Birkhead (1988), Bregulla (1992), Brooke (1976), Byrd (1979), Carr (1988), Caum (1933), Cheke (1987), Chen Fuguan *et al.* (1998), Counsilman (1971, 1974a,1974b, 1977), Counsilman *et al.* (1994), Craig (1997c), Crump & Perrins (1994), Cresswell *et al.* (1997), Davidar (1991), Dean & Macdonald (1981), Dementiev *et al.* (1954, 1970), Dhanda & Dhindsa (1993, 1996), Dubale & Patel (1975a, 1975 b), Eddinger (1967), Feare (1976, 1994), Feare *et al.* (1994), Fry *et al.* (2000), Gadjil (1972), Grant (1982), Greig-Smith (1982), Griffin (2008), Hails (1984, 1987), Hars (1991), Higgins *et al.* (2006b), Hockey *et al.* (2005), Holyoak & Thibault (1984), Holzapfel *et al.* (2006), Ishtiaq *et al.* (2006), Jacot Guillarmod *et al.* (1979), Jones (1996), Kang Nee (1989, 1992), Kang Nee *et al.* (1990), Kannan & James (2001), Komdeur (1996), Lamba (1963b), Legge (1880), Leven & Corlett (2004), Lever (2005), Lin Rueyshing (2001), Louette *et al.* (2008), Macdonald (1973), Mahabal (1993), Mahabal & Vaidya (1989), van Marle & Voous (1988), Martin, W.K. (1996), Mat & Davison (1984), McCarthy (2006), McCulloch (1991), Medway & Wells (1976), Mishra *et al.* (1987), Moeed (1976b), Naik (1970), Naik & Naik (1969), Narang & Lamba (1984), Newey (2007), Page & Oatley (1979), Peacock *et al.* (2007), Pell & Tidemann (1997), Rahman & Hussain (1988), Raju & Rao (2004), Rasmussen & Anderton (2005b), Roberts (1992), Robertson *et al.* (2007), Robson (2000), Ruempler & Ruempler (1996), Schodde & Mason (1999), Sengupta (1968, 1969, 1973, 1976, 1982), Skerrett *et al.* (2001), Sontag (1998), Sontag & Louette (2007), Stoner (1923), Toor & Ramzan (1994), Warner (1968), Watling (1975, 1982), Watson *et al.* (1992), Wells (2007), Wilson (1973), Yap & Sodhi (2004), Yap *et al.* (2002).

64. Vinous-breasted Myna

Acridotheres burmannicus

French: Martin vineux **German**: Burmamaina **Spanish**: Miná Birmano
Other common names: Vinous-breasted Starling, Jerdon's Starling

Taxonomy. *Sturnia burmannica* Jerdon, 1862, Thayetmyo, south-west Myanmar.
Often placed in genus *Sturnus*, but appears behaviourally and vocally closer to present genus. May form a superspecies with *A. melanopterus*. Two subspecies recognized.
Subspecies and Distribution.
A. b. burmannicus (Jerdon, 1862) – Myanmar and S China (extreme SW Yunnan).
A. b. leucocephalus Giglioli & Salvadori, 1870 – Thailand (except NW & S), Cambodia, C & S Laos and Vietnam (except N).



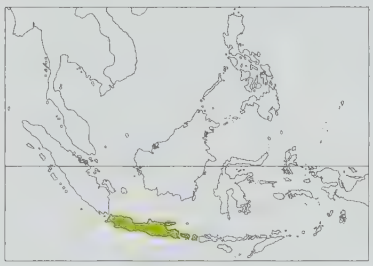
Descriptive notes. 22 cm. Small myna with comparatively pale plumage, forehead and crown feathers hackled and elongate. Nominate race has forehead and crown dull white, upperparts greyish-brown; upperwing brown, primaries with white bases, secondaries paler brown with dark margins, primary coverts white; tail brown, white tips of rectrices (broader on outer feathers); chin, throat and upper breast white, rest of underparts vinous, paler in centre and on undertail-coverts, greyer on flanks; underwing-coverts white; iris whitish; bill orange-red, blackish base of lower mandible; legs orange-yellow. Sexes alike. Juvenile is duller than adult, with brown crown, brown iris. Race *leucocephalus* is darker than nominate, typically has top of head greyer, back darker (producing pale collar around neck), wings and tail darker, tips of rectrices buffy, rump light buffish to whitish, breast and belly pinker, iris variable, recorded as yellow, brown, grey or black, bill yellow with red base. Voice. Loud and harsh "chew-ii", "tchew-iri-tchew-iri-tchieuw" and similar, also chattering calls during foraging; calls said to be very like those of *A. tristis* and those of *Gracupica nigricollis*.
Habitat. Open grassland, gardens and playing fields, cultivated areas and scrub, semi-desert, also large clearings in forest; very common in disturbed habitats and cultivated areas in SE Thailand. To 1500 m.
Food and Feeding. Diet presumably includes fruit and insects. Forages mainly on ground, but also in trees. In pairs and small flocks. Large, noisy communal roosts in bamboo, reeds or sugar cane.
Breeding. Season Apr–Nov; multi-brooded. Nest a large untidy mass of vegetation, placed in hole in tree, under house eaves or in thatched roof. No further information.
Movements. Local movements suggested by variable occurrence in particular areas. Records in Peninsular Malaysia and Singapore refer either to vagrants or to escaped captives.
Status and Conservation. Not globally threatened. Fairly common to common in most of range; rare within tiny range in China. Has adapted well to man-modified habitats. Nominate race is a rare exotic in Taiwan, where it has not managed to become established.
Bibliography. Chen Fuguan *et al.* (1998), Feare & Craig (1998), Lekagul & Round (1991), Lin Rueyshing (2001), McCarthy (2006), Rasmussen & Anderton (2005a, 2005b), Robson (2000), Smythies (1986), Sontag (1998), Stuart Baker (1926), Wells (2007).

65. Black-winged Myna

Acridotheres melanopterus

French: Martin à ailes noires **German**: Schwarzflügelmaina **Spanish**: Miná Alinegro
Other common names: Black-winged/White-breasted Starling

Taxonomy. *Gracula melanoptera* Daudin, 1800, "Inde" = Western Java.
Sometimes placed in genus *Sturnus*, but appears behaviourally and vocally closer to present genus. May form a superspecies with *A. burmannicus*. Three subspecies currently recognized.
Subspecies and Distribution.
A. m. melanopterus (Daudin, 1800) – Java (except SE part) and Madura I.
A. m. tricolor (Horsfield, 1821) – SE Java (E of Tosari).
A. m. tertius (E. J. O. Hartert, 1896) – Bali (including Nusa Penida) and Lombok.
Introduced (nominate race) in Singapore.



Descriptive notes. 23 cm. Small myna with striking black-and-white plumage; feathers of forehead, crown and nape hackled, and nape feathers elongated to form erectile crest. Nominate race is white, except remiges, which are black with bronze-green gloss (white bases to primaries), and tail, which is black with white tips, latter broader towards outer rectrices; iris dark brown, bare yellow skin around eye extending in small triangle behind eye; bill yellow, usually with darker, greyish base and gape; legs fleshy-yellow to pinkish-flesh. Sexes alike. Juvenile has grey crown to back. Races variable; *tricolor* has back grey, and largely black upperwing-coverts; *tertius* has grey mantle to uppertail-coverts, and extensively black upperwing-coverts. Voice. Flight call a high-pitched whistle, "tsoowit"or "tsoowee"; alarm a harsh "kaar". Disyllabic "kishaa kishaa" frequent from feeding birds; duet between apparent members of a pair. Also repeated "cha cha cha" with downward inflection on each note, throaty "chok", and other whistles and squawks. Calls resemble those of *A. tristis* and *A. javanicus*.
Habitat. Cultivated lands, fallow fields, grazing land, lawns and orchards, to c. 1300 m; recorded in E Java locally to 2400 m. Formerly in primary and secondary monsoon forests, as well as open savanna areas in lowlands, and suburban areas.
Food and Feeding. Diet fruit, nectar and insects. Mantids (Mantodea) recorded, also nectar of *Pithecellobium dulce*, and fruits of *Fagraea fragrans*, *Eugenia longiflora*, *Morus indica*, *Manilkara kauki*, *Passiflora foetida* and *Strychnos ligustrina*. Forages in trees, and on the ground in grassland and on beach. In pairs and small flocks. Roosts communally in tall trees, sometimes with *Leucopsar rothschildi*, and forms pre-roosting assemblies.
Breeding. Season Jan and Mar–May in W Java; recorded in Feb in most of Bali, but Jun in E of island. Presumed monogamous; this supported by evidence of duetting by pair-members. Nest in hole in rock or tree; one nest-hole lined with twigs. Clutch 3–4 eggs, plain sky-blue. No other information.
Movements. Presumed resident; local movements in response to flowering and fruiting of forest trees.
Status and Conservation. ENDANGERED. Rare and local; has declined since at least 1960s. Status on Lombok uncertain; very few records, and these may refer to vagrants or perhaps to escaped cagebirds. Very few records also from Madura. Formerly common; rapid recent decline appears to be consequence of unsustainable exploitation for cagebird trade; pesticides in agricultural areas also a possible threat. In survey undertaken in 2001 of 33 locations with historical records of this species, total of only 32 individuals found (at three sites), and absent at 30 sites. On Bali, originally concern over this species as possible competitor for *Leucopsar rothschildi*; it seems now, however, to have taken the place of latter as the species most frequently captured for cagebird trade. Has been nominally protected under Indonesian law since 1979. Occurs in at least three protected areas: Baluran National Park and Pulau Dua Reserve, in Java, and Bali Barat National Park, in Bali (maximum of 24 individuals). Breeding population in Singapore, thought to be derived from escaped cagebirds, is now apparently extinct.
Bibliography. Anon. (2008b), Butchart & Stattersfield (2004), Coates & Bishop (1997), Collar *et al.* (2001), Feare & Kang Nee (1992), Hails (1987), Harrison (1963b), Hoogerwerf & Hellebrekens (1967), Hoogerwerf & Rengers Hora Siccama (1938), Mees (1996), Morrison (1980), Rensch (1930, 1931), Robson (2000), Sieber (1978), Sody (1930), Stattersfield & Capper (2000), Trollope (1987), Wells (2007), White & Bruce (1986), de Wiljes (1957).

PLATE 44 ➤



PLATE 44

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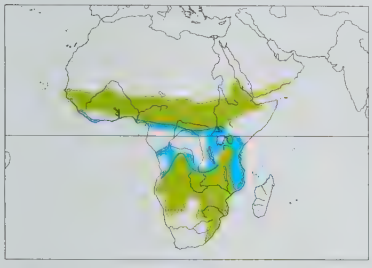
Genus *CINNYRICINCLUS* Lesson, 1840

66. **Amethyst Starling**

Cinnyricinclus leucogaster

French: Étourneau améthyste **German**: Amethystglanzstar **Spanish**: Estornino Amatista
Other common names: Plum-coloured/Violet(-backed) Starling

Taxonomy. *Turdus leucogaster* Boddaert, 1783, no locality = Benin.
Genus possibly close to *Pholia*. Three subspecies recognized.
Subspecies and Distribution.
C. l. leucogaster (Boddaert, 1783) – breeds from Senegal E, S of Sahara and N of equator, to Sudan, possibly also Eritrea, Ethiopia and NW Somalia; non-breeding also in coastal areas, Gabon, PRCongo and N DRCongo, and S to Kenya.
C. l. arabicus C. H. B. Grant & Mackworth-Praed, 1942 – breeds S Arabian Peninsula (S Yemen E to SW Oman); probably also Eritrea, Djibouti, N Ethiopia, E Sudan and NW Somalia.
C. l. verreauxi (Bocage, 1870) – breeds from S DRCongo and Angola S to C Namibia and, in E, from S Kenya and W Tanzania S to Botswana, NE South Africa, Swaziland and Mozambique; in non-breeding season more widespread.



Descriptive notes. 16 cm; 33–56 g. Male nominate race has head and upperparts, including upperwing-coverts and tail, iridescent purple, in fresh plumage with strong blue overtone (with wear, coppery-plum colour predominates); purple primaries less iridescent, and when worn appear dark brown; chin, throat and upper breast iridescent purple, lower breast, belly, flanks, thighs and undertail-coverts pure white; iris has yellow outer ring, dark inner ring; bill and legs black. Female is very different from male, lacks any iridescence; crown, nape and side of head brown with dark central streaks on feathers, mantle to rump and tail dark brown with paler feather margins; wing dark brown, paler margins on coverts and secondaries, rufous on inner webs of primaries; chin, throat and underparts white with dark central streaks, broadest on breast; bare parts as for male. Juvenile resembles female, but has broader rufous feather edges, iris dark brown, bill and legs brown. Race *verreauxi* is larger than nominate, male has white base of outermost rectrix; *arabicus* male is very like nominate, female has almost plain brown upperparts lacking pale feather edgings. Voice. Song a varied phrase of up to 15 twanging notes and piping sounds; male sings near nest while female incubating or brooding; captive female sang varied song, including imitations of human whistles and calls of other birds in aviary. Contact calls are soft whistles and piping calls, unlike vocalizations of other glossy starlings (e.g. *Lamprotornis*).
Habitat. Open woodland areas and riverine woodland, to 2200 m in Malawi and recorded to 3000 m in Kenya; may occur around clearings in lowland forest, and on forest edge and in agricultural areas, as in E Usambaras, in Tanzania.
Food and Feeding. Mainly frugivorous, but insects also taken. Fruits eaten include those of *Celtis*, *Carissa edulis*, *Euclea divinorum*, *Apodytes dimidiata*, *Canthium lactescens*, *Clerodendron myricoides*, *Rhus*, *Zizyphus*, *Ficus*, *Lannea*, *Boscia pechuelli*, *Loranthus*, *Rotheca myricoides*, *Tapinanthus leendertziae*, *Morus*. Insects recorded include alate termites (Isoptera) and winged ants (Formicidae). In captivity, adults fed young entirely with live food. Hawks insects in air; some insects gleaned from branches. Important dispersal agent of the mistletoe *Phragmanthera dschallensis* in South Africa, regurgitating seeds after feeding. Forages primarily in trees; unlike many other starlings, spends little time on the ground, even in captivity. In pairs and in flocks; often associated with *Lamprotornis chalybaeus* and sometimes *Creatophora cinerea* in Kenya, and occasionally forages with mixed-species flocks of insectivores in trees.
Breeding. Season Mar–May in W Africa; Mar–Apr in Arabian Peninsula; Mar–Jul in Kenya, Nov–Dec in Tanzania; in DRCongo Aug–Oct in N and Jul–Nov in SE; Oct–Nov in Zambia and Malawi; Oct–Jan in S Africa, later (peak Feb–Mar) in Namibia. Monogamous. Nest 2–6 m above ground in tree hole, including old hole of woodpecker (Picidae), sometimes in hollow fence post, hole lined by both sexes, commonly with dung (donkey, horse and elephant dung recorded) and green leaves (*Euclea divinorum* at a nest in Kenya, *Olea* at one in South Africa); in captivity, used only leaves as lining in nestbox, and sometimes added leaves even during nestling period. Clutch 2–4 eggs, most often 3, eggs pale blue with fine purplish spots, more heavily spotted at thick end; incubation by female alone, period 12–14 days; chicks fed by both parents, one record of two males and one female feeding chicks (but no evidence that co-operative breeding a regular occurrence), nestling period c. 21 days. Brood parasitism by Lesser Honeyguide (*Indicator minor*) recorded; possibly also host to Greater Honeyguide (*Indicator indicator*) in Kenya.
Movements. Migratory in many regions, some populations apparently resident. In S of range almost entirely a breeding migrant S of R Okavango and R Zambezi, with virtually no overwintering; farther N, either some move only locally or breeding population replaced by birds from other areas. In Zambia, generally much less common winter months of Apr–Aug, but at some sites (e.g. Livingstone) most common during these months, suggesting that both breeding and non-breeding populations present within country; movements here primarily N–S. N of equator, no confirmed breeding in Sudan, Ethiopia and Eritrea, and only one probable breeding record from Somalia; non-breeders in this region could represent S breeders moving N, or migrants which bred in Arabian Peninsula, or birds from farther W. Within W Africa evidence of N–S movements in Nigeria, Ghana, Togo, Benin and Burkina Faso, but in some areas (e.g. coastal Nigeria) the species is considered resident. Breeding and movements likely to be determined by local rainfall regime and subsequent availability of fruit. Vagrant recorded in S Israel.
Status and Conservation. Not globally threatened. Widespread and generally common to locally abundant. In S of range, numbers in Kruger National Park, in South Africa, where a summer breeding migrant, estimated at more than 32,000 individuals; minimum of 20,000 estimated for C & S Mozambique.

Bibliography. Amadon (1956), Amsler (1935), Anciaux (2002), Ash & Miskell (1998), Aspinwall (1981), Becker (1980), Benson (1946b), Borghesio *et al.* (2008), Borrett (1971), Borrow & Demey (2001), Botz (1991), Brosset & Érard (1986), Carswell *et al.* (2005), Cornwallis & Porter (1982), Craig (1997c), Cummings (1959), Dean (2000b), Dowsett *et al.* (2008), Elgood *et al.* (1973), Ellis (1980), Fry *et al.* (2000), Ginn (1986), Hockey *et al.* (2005), Hoesch & Niethammer (1940), Jones (1945), Joubert (1943), Kemp *et al.* (2001), Kirkpatrick (1992), Mackworth-Praed & Grant (1950), Nikolaus (1987), Parker (1999, 2005), Pyper (1991), Roxburgh (2007), Serle (1965), Short & Horne (1985b, 2005), Smith (1957), Swynnerton (1908), Symons (1949), Traylor (1971), Vincent, A.W. (1949), Vincent, J. (1936).

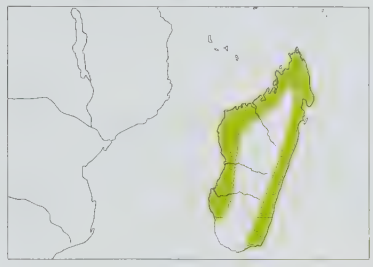
Genus *HARTLAUBIUS* Bonaparte, 1853

67. **Madagascan Starling**

Hartlaubius auratus

French: Étourneau malgache **German**: Madagaskarstar **Spanish**: Estornino Malgache

Taxonomy. *Turdus auratus* Statius Müller, 1776, Madagascar.
Genus often subsumed into *Saroglossa*. Monotypic.
Distribution. Coastal areas of Madagascar (except arid SW corner).



Descriptive notes. 20 cm; 40 g. Distinctive starling with outermost rectrices longer than others, producing forked tail. Male has dark chocolate-brown head, rest of upperparts lighter brown; wing dark blue with some violet gloss, broad white strip on outer web and oval white patch on inner web of six outermost primaries, also white outer web on alula; tail dark blue-green with some gloss, outermost feathers with white outer web; below, brown of head extends as bib-shaped area to centre of breast; breast and flanks otherwise dark chocolate-brown, centre of belly, thighs and undertail-coverts white; iris brown; bill and legs black. Female has plumage pattern like male's but less glossy; crown and nape brown with pale feather edges, chin to chest and flanks grey-brown with dark central streaks on individual feathers. Juvenile resembles female. Voice. High-pitched "chee chreetee" song from conspicuous perch, given for minutes at a time, the only vocalization described.
Habitat. Humid areas with woodland; also regularly on fringes of clearings and cultivated areas near human activity. Below 1800 m.
Food and Feeding. Diet mainly fruit (according to stomach contents); also insects and nectar. Recorded food items are figs (*Ficus*), also berries; several seen to feed on bee larvae (*Apis*) at damaged bee hive. Often forages in treetops. Feeds in small flocks of 4–22 individuals, sometimes in company of other frugivores such as Madagascar Green-pigeon (*Treron australis*); rarely joins mixed-species flocks of insectivores.
Breeding. Season Sept–Nov, according mainly to gonadal development of specimens. Nest in tree hole. Eggs pale blue with rusty-brown spots. No other information.
Movements. Presumed to move locally in relation to fruiting cycles of plants; observations indicate periodic occurrence in many areas where not reported often.
Status and Conservation. Not globally threatened. Widespread and relatively common, even in modified habitats and near villages and cultivated areas. Poorly known for a species which is frequently encountered by biologists. Malagasy name (*Vorontainaomby*) reflects association with cow dung, implying a familiar bird which forages for insects at dung pats.
Bibliography. Benson *et al.* (1977), Feare & Craig (1998), Goodman, Pidgeon *et al.* (1997), Langrand (1990), Milon *et al.* (1973), Rand (1936), Steinbacher (1972).

Genus *ONYCHOGNATHUS* Hartlaub, 1849

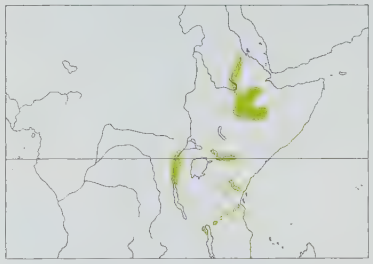
68. **Slender-billed Starling**

Onychognathus tenuirostris

French: Rufipenne à bec fin **German**: Zimtflügelstar **Spanish**: Estornino Picofino
Other common names: Slender-billed Red-winged Starling

Taxonomy. *Lamprotornis tenuirostris* Rüppell, 1836, Ethiopia.
Proposed race *theresae* (described from N Aberdares, in Kenya) considered largely inseparable from birds in rest of species' range. Treated as monotypic.
Distribution. Extreme SC Eritrea S to C & S Ethiopia; E DRCongo, SW Uganda, Rwanda and Burundi; Mt Elgon (Uganda–Kenya border) and W & C Kenya; NE & S Tanzania (Eastern Arc Mts); and NE Zambia and N Malawi (Nyika Plateau).
Descriptive notes. 25–30 cm; 127–142 g. Dark starling with rufous in wing, long sharply graduated tail. Male has crown, nape and chin black with greenish gloss, upperparts and entire underparts purple-black; upperwing black with greenish gloss, primaries reddish-brown with broad band of black at tip (in flight, wing patch appears centrally positioned); tail black with greenish gloss; iris hazel-brown; bill black, often pale tip; legs black. Female differs from male in having crown, nape, side of head, chin and throat duller greenish-black with grey feather tips, upperparts dull black, and underparts dull black with broad grey crescents at feather tips, producing scalloped

On following pages: 69. Pale-winged Starling (*Onychognathus nabouroup*); 70. Red-winged Starling (*Onychognathus morio*); 71. Neumann's Starling (*Onychognathus neumanni*); 72. Bristle-crowned Starling (*Onychognathus salvadorii*); 73. Somali Starling (*Onychognathus blythii*); 74. Socotra Starling (*Onychognathus frater*); 75. Tristram's Starling (*Onychognathus tristramii*); 76. White-billed Starling (*Onychognathus albirostris*); 77. Waller's Starling (*Onychognathus walleri*); 78. Chestnut-winged Starling (*Onychognathus fulgidus*).



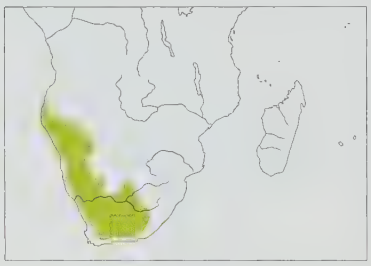
effect. Juvenile is dull sooty black, with bluish wash on wings and tail. Voice. Song, often in chorus, consists of whistles and harsher notes. Flight call a high-pitched "pleek"; sustained harsh whistling and chattering in flocks, reminiscent of parrots (Psittacidae).
Habitat. Inhabits montane forest from 1500 m to 3000 m, ranging up into alpine moorland zone as high as 5000 m; also descends to cultivated areas below forest. Breeds mostly at 1300–2300 m.
Food and Feeding. Diet primarily fruit; also nectar, and some invertebrates. Fruits taken include those of *Trema*, *Alongium*, *Sapium ellipticum*, *Schefflera goetzenii*, *Podocarpus milanjianus*, *Urera hypselodendron*, *Olea africana*, *Prunus africanus*, *Ocotea michelsonii*, *Ilex mitis*, *Macaranga neomildbreadiana*, *Polyscias fulva*, *Allophylus abyssinicus* and *Maesa lanceolata*. Takes nectar from *Lobelia* flowers, and may contribute to pollination. Small snail (Gastropoda) and pupae of blackflies (Simuliidae) found in stomach contents. Forages in trees, stretching to reach fruit clusters more than do other starling species. Hawks insects in flight; forages on wet boulders along streams. Often in flocks; large flocks of 50–100 individuals visit fruiting trees. In Ethiopia associates with *O. blythii*, elsewhere also with *Pholia sharpii*.
Breeding. Season Dec–Jan in Ethiopia, Dec in Ruwenzori region of SW Uganda, Jan–Mar and Aug–Dec in Kenya and Tanzania, and Sept–Dec in Zambia and adjoining Malawi; timing possibly related to water levels in mountain streams; sometimes double-brooded. Monogamous. Solitary or in small colonies. Nest built by both sexes, a mud base with moss, lined with grass, placed on ledge of rock face along mountain stream, often in cave under waterfall; same site used in successive years. Clutch 2–4 eggs, pale blue with fine red-brown spotting; incubation by female only, fed on nest by male, period 13 days; chicks fed by both sexes, brooded by female alone, nestling period c. 23 days. In one year 12 eggs produced only one fledgling; in another year 13 eggs produced six flying young.
Movements. Presumed mostly resident; extensive altitudinal movements and some local wandering.
Status and Conservation. Not globally threatened. Locally common to very common; uncommon to scarce in Eritrea (Senafe and Guna Guna region).
Bibliography. Amadon (1956), Benson (1946b), Brown (1965), Carswell *et al.* (2005), Chapin (1954), Dowsett *et al.* (2008), Dowsett-Lemaire (1983a, 1990), Fry *et al.* (2000), Lynes (1934), Moermond (1992), Moermond *et al.* (1993), Ogilvie-Grant (1910), Prigogine (1971), Young (1982).

69. Pale-winged Starling

Onychognathus nabouroup

French: Rufipenne nabouroup **German**: Fahlflügelstar **Spanish**: Estornino Naburup

Taxonomy. *Sturnus nabouroup* Daudin, 1800, Kamies Mountains, Namaqualand, South Africa.
Proposed race *benguellensis* described (from Benguela, in W Angola) on basis of shorter wing, but differences from birds in rest of species' range considered trivial. Treated as monotypic.
Distribution. SW Angola, Namibia (except E) and W interior of South Africa (E to S Free State and W Eastern Cape).



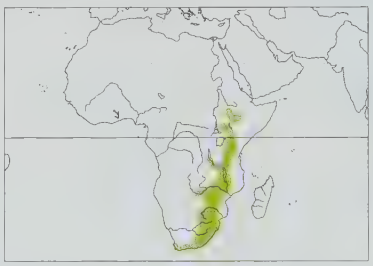
Descriptive notes. c. 27 cm; 94–122 g. Plumage is uniformly glossy black, except for narrow pale rufous panel visible on folded wing, some whitish of central primaries often visible; all primaries broadly tipped black, the inner five otherwise creamy-white, the outer four creamy-white on inner web and rufous-brown on outer (in flight, white patch appears centrally positioned in wing); iris orange-yellow; bill and legs black. Sexes alike. Juvenile is less glossy than adult, iris brown. Voice. Song of male a varied warbling, reminiscent of that of *Lamprotornis nitens*. Both sexes give warbling calls when perched. Flight call a ringing "preeoo"; alarm a harsh "churr" (the only call resembling equivalent *O. morio* vocalization).
Habitat. Arid country, from semi-desert to desert conditions, also entering towns to forage; from sea-level to 2000 m. Activities centred on rocky outcrops or cliffs, where roosting and nesting take place.
Food and Feeding. Diet fruit and arthropods; also nectar from *Aloe ferox*. Fruit of *Phoenix reclinata*, *Diospyros lycioides*, *Cussonia paniculata*, *Lycium*, *Heeria insignis*, *Ficus*, *Boscia albitrunca*, *Cotoneaster salicifolia*, *Crotalaria steudneri*, *Olea africana*, *Rhus lancea*, *Zizyphus mucronata*. Ticks (Acarina) taken, also insects such as alate termites (Isoptera), grasshoppers (Orthoptera), butterflies and caterpillars (Lepidoptera), beetles (Coleoptera). Enters towns to feed on date palms. Insects caught on ground, hawked in air or gleaned from vegetation. In Namibia and South Africa, regularly perches on klipspringers (*Oreotragus oreotragus*) and grooms ectoparasites from them, tolerated by the antelope; removes ticks also from both Cape mountain (*Equus zebra*) and Hartmann's mountain zebras (*Equus hartmanni*), and from desert-dwelling giraffes (*Giraffa camelopardalis*) in Namibia. In pairs and small groups.
Breeding. Season Nov–Apr in Namibia and Oct–Mar in South Africa; may be double-brooded. Monogamous; partners appear to remain together over several seasons. Semi-colonial, several pairs nesting on same cliff. Nest built by both sexes, from dry sticks wedged across rock cleft, with bowl of dry grass, animal hair and, in one case, needle-like leaves of *Parkinsonia africana* (no mud used), placed in crevice (usually a vertical cleft) in rocks; rarely, similar site in building utilized. Clutch generally 3 eggs, pale greenish, spotted and smudged with red-brown markings; incubation by female, male perches nearby (and often sings for extended periods), period 13–14 days; chicks fed by both male and female, nestling period c. 25 days. Nests regularly parasitized by Great Spotted Cuckoo (*Clamator glandarius*); will attack cuckoos near nests.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Common to abundant over wide range in sparsely populated regions.
Bibliography. Craig (1983c, 1988b, 1997j), Craig & Hulley (1992), Craig *et al.* (1989, 1991), Dean (2000b), Fennessy (2003), Fry *et al.* (2000), Hockey *et al.* (2005), Hulley *et al.* (2002), Jensen & Jensen (1969), Joubert (1972), Jubb (1980a), Kemp *et al.* (1972), Kok & van Ee (1990), Macdonald (1957), Penzhorn (1981), Penzhorn & Horak (1989), Steenkamp & Bridgeford (2002), Tilson (1977).

70. Red-winged Starling

Onychognathus morio

French: Rufipenne morio **German**: Rotschwingenstar **Spanish**: Estornino Alirrojo
Other common names: Redwing/African Red-winged Starling

Taxonomy. *Turdus morio* Linnaeus, 1766, Cape of Good Hope, South Africa.
Has been thought to form a superspecies with *O. tristramii*. Sometimes treated as conspecific with *O. neumanni*. Two subspecies recognized.
Subspecies and Distribution.
O. m. rueppellii (J. Verreaux, 1856) – S Sudan, N Kenya and C Ethiopia; perhaps also NE Uganda.
O. m. morio (Linnaeus, 1766) – E Uganda, C Kenya, Tanzania, E DRCongo, E & S Zambia, Malawi, Zimbabwe, W Mozambique, E Botswana, and E & S South Africa.



Descriptive notes. 30 cm; 115–155 g. Dark starling with rather long, pointed tail. Male plumage is glossy black with inky-blue sheen, except for rufous patch visible on folded wing; all primaries chestnut-brown with short black tips (in flight, large rufous area in wing); iris dark red; bill and legs black. Female is like male, except that crown, nape, side of head, chin, throat and upper breast are ash-grey with some darker streaks (close to feather margins). Juvenile resembles male but less glossy, iris dark brown, bill brown. Race *rueppellii* is larger than nominate, with proportionately longer tail (longer than wing). Voice. Song a complex of pure, musical whistles and warbling notes; both sexes sing, some elements sex-specific, others shared; very few notes unique to an individual. Contact call often a 2-note "tweetwoo"; harsh "charr" alarm, low "kwok-kwok" when attacking potential nest predators; flocks produce mixture of whistles and song phrases. Captive individual hissed and snapped mandibles in threat.
Habitat. Original habitat rocky outcrops, gorges and mountainous regions with access to well-vegetated feeding areas; now common in many urban areas. To 2500 m Ethiopia, and seen above 4000 m on Mt Elgon (Uganda); sea-level to 3000 m in South Africa. Generally avoids arid regions and lowlands of E coast.
Food and Feeding. Diet principally fruit, but almost omnivorous and highly opportunistic. Recorded items include arils of invasive alien *Acacia cyclops*; fruit of *Ficus glumosa*, *Carissa edulis*, *Euclea divinorum*, *Canthium latescens*, *Phoenix reclinata*, *Protorhus longifolia*, *Celtis africana*, *Commiphora harveyi*, *Schefflera umbellifera*, *Scutia myrtina*, *Melia azederach*, *Ficus thonningii*, *Trichilia emetica*, *Cinnamomum zeylanicum*, *Juniperus*, *Lycium*, *Rhus longispina*, *Cussonia paniculata*, *Cassytha ciliolata*, *Coploon compressum*, *Trema*, *Morus*. Nectar from *Agave sisalana*, several species of *Aloe*, *Erythrina caffra*, *Erythrina latissima*, *Schotia brachypetala*, *Salvia faricana-lutea*, *Leucospermum conocarpodendron*, *Mimetes fimbiifolius*, *Protea subvestita*. Large seeds such as those of *Diospyros pubescens*, *Scutia myrtina*, *Lucium campanulatum*, *Phoenix reclinata* and the exotic *Brachychiton acerifolium* are regurgitated; smaller seeds retained in the gut, and may thus be transported farther. Sometimes forages on fruit alongside baboons (*Papio*) and hornbills (Bucerotidae). Animal food includes carrion, frogs, lizards, freshwater crabs (Decapoda), scorpions (Scorpiones), solifugids, spiders (Araneae), sandhoppers (Amphipoda), millipedes (Diplopoda), snails (Gastropoda) and intertidal molluscs (Mollusca), ticks (Acarina); many insects, e.g. termites (Isoptera), ants, bees and wasps (Hymenoptera), grasshoppers (Orthoptera), stick-insects (Phasmida), butterflies and caterpillars (Lepidoptera), beetles (Coleoptera), cicadas (Cicadidae). Forages in trees and bushes, and on ground, where it hops; feeds in intertidal zone. Attracted to salt deposits in Kenya. Hawks insects, even after dark at floodlights. Large prey items often broken up at an "anvil" site near nest, and then delivered piecemeal to chicks. Regularly associates with klipspringers (*Oreotragus oreotagus*), from which it removes ticks, and may feed on secretions from preorbital glands of this antelope; also gleans ectoparasites from eland (*Taurotragus oryx*), Cape mountain zebra (*Equus zebra*) and impala (*Aepyceros melampus*); perches on sheep, which are apparently exploited only to flush prey, but when perched on cattle this species routinely removes ticks (particularly from ears and under tail). At car parks gleans insects from radiator grilles of vehicles, and scavenges food at picnic sites and outdoor restaurants. On University of Cape Town campus (South Africa), resident birds fly through indoor passageways to the dining halls, collect food from cafeteria trays, and fly out to eat it in the courtyards. Occurs in pairs and in small flocks. Pair may roost at nest-site; communal roosts of up to 500 or more individuals on cliffs, buildings or tall trees; sometimes roosts in reedbeds along with *Creatophora cinerea* or *Acridotheres tristis*, also with weavers (*Ploceus*) and even with Common Black-shouldered Kites (*Elanus caeruleus*). Anting recorded occasionally in wild birds.
Breeding. Season Apr and Oct in Ethiopia; all months except Jun–Jul (peak Nov–Dec and Mar) in E Africa; recorded Sept–Mar (mainly Nov–Jan) in Zambia, Nov–Dec in Malawi, and Sept–Mar in S Africa; commonly double-brooded. Monogamous; probably long-term pair-bond. Nest built by both sexes over about six days, base generally includes mud, with grass, rootlets and sticks, lined with grass or other material (e.g. horsehair, or variety of "non-natural" materials may be included), placed on ledge, typically on rock or cliff, now often on building (first records in South Africa in 1880), including sites such as roof above petrol pumps at busy service station; sometimes on leaf bases of palm; even on wreck of fishing trawler 200 m offshore; some nest-sites occupied for more than 35 years. Aggressive around nest-site, attacking both humans and domestic animals, and other bird species, including African Palm-swift (*Cypsiurus parvus*); killed adult Rock Martin (*Ptyonoprogne fuligula*) and a bat (Chiroptera), and nestlings of Familiar Chat (*Cercomela familiaris*). Clutch 2–4 eggs; incubation by female, fed on nest by male, rarely male may sit, period 13–14 days (reports of eggs hatching after 23–25 days require confirmation); chicks fed by both parents, also captive young fed by unrelated adults (primarily female) concurrently feeding own nestlings c. 200 m away; nestling period 22–28 days, in captivity 22–25 days. Brood parasitism by Great Spotted Cuckoo (*Clamator glandarius*) regular in some areas. Nests robbed by Pied Crows (*Corvus albus*) and African Harrier-hawk (*Polyboroides typus*); baboons (*Papio*) also significant nest predators.
Movements. Mainly resident. Nomadic flocks containing more than 200 individuals collect during non-breeding season; ringing recoveries indicate that some individuals move distances in excess of 100 km.
Status and Conservation. Not globally threatened. Wide-ranging, and abundant in many areas. Numbers in Kruger National Park, in South Africa, estimated at more than 4000 individuals, even though limited suitable habitat is available; maximum of 500 in adjacent S Mozambique. Has colonized and exploited human settlements, and expanded breeding range through use of buildings

as nest-sites. Unprotected in some regions of South Africa, owing to the damage which it inflicts on fruit crops.

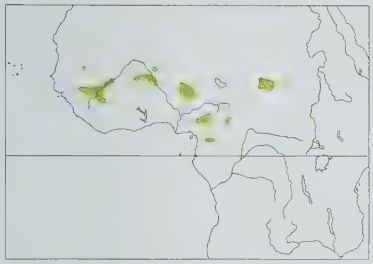
Bibliography. Amadon (1956), Archer (1993), Beasley (1978, 1991), Bleher *et al.* (2003), Broekhuysen (1951), Brooke (1995), Brown, D. (2003, 2006), Brown, L.H. (1965), Buchan (1999), Carswell *et al.* (2005), Craig (1983c, 1988c, 1997i, 1999), Craig & Hulley (1992), Craig *et al.* (1989, 1991), Cunningham-van Someren (1974), Dorst & Roux (1973), Dowsett *et al.* (2008), Drummond (1991), Erlanger (1905), Everitt (1964), Fraser (1990), Fraser & McMahon (1995), Fry *et al.* (2000), Gargett (1975), Glyphis *et al.* (1981), Gordon (1974), Hockey *et al.* (2005), Jacot Guillarmod *et al.* (1979), Kemp *et al.* (2001), Kilpin (2002), King (2006), Kok & van Ee (1990), Marc (1982), McCarthy (2006), Mitchell (1976), Mortimer (1975), Mungure (1973), Nikolaus (1987), Oatley & Fraser (1992), Oatley & Skead (1972), Parker (1999), Patten (1980a, 1980b), Peat (2004), Roberts (1995), Roche (2004), Rowan (1955, 1971), Sclater & Moreau (1933), Shaw (1991), Short & Horne (2005), Skead, C.J. (1995), Skead, D.M. (1966), Taylor, J.S. (1936), Taylor, R.H. (1974), Tribe (1991), Vernon (1993), Watson (1995), Webster (1987).

71. Neumann's Starling

Onychognathus neumanni

French: Rufipenne de Neumann **German**: Neumannstar **Spanish**: Estornino de Neumann
Other common names: Neumann's Red-winged Starling, Crag Chestnut-winged Starling

Taxonomy. *Amydrus neumanni* Alexander, 1908, Petti, northern Nigeria.
Sometimes treated as conspecific with *O. morio*. Two subspecies recognized.
Subspecies and Distribution.
O. n. modicus Bates, 1932 – S Mauritania, E Senegal, NE Guinea, SW Mali, N Ivory Coast and SW Burkina Faso.
O. n. neumanni (Alexander, 1908) – E Mali, S Niger, N & SE Nigeria, N & S Cameroon, E Chad and adjacent W Sudan, and W Central African Republic.



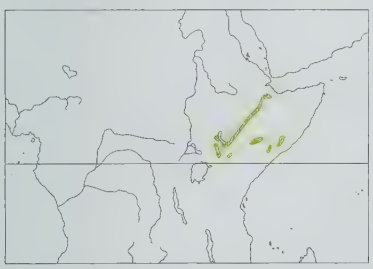
Descriptive notes. 25–30 cm. Large dark starling with long, graduated tail and heavy, deep bill. Male nominate race has uniformly glossy black plumage, except for narrowly black-tipped chestnut primaries; iris dark red; bill black; legs black. Female has crown, nape, side of head, chin, throat and upper breast ash-grey with some blue-black streaking; otherwise resembles male. Juvenile resembles male but duller. Race *modicus* is somewhat shorter-tailed than nominate, with tail shorter than wing length, iris brown. Voice. Low whistle from perched birds and musical "too-whee-oo" from nesting pair; melodious whistles reminiscent of those of orioles (*Oriolus*). Alarm a harsh "air air".
Habitat. Rocky outcrops, cliffs and inselbergs within Sahel zone; also around houses along R Niger. As low as 500 m in Nigeria; up to 2500 m in Sudan.
Food and Feeding. Diet mainly fruit, including figs (*Ficus*) and dates of palm *Phoenix reclinata*; possibly nectar of *Bombax*; insects such as ants (Formicidae); also small snails (Gastropoda), which are broken on an "anvil". In pairs and small flocks.
Breeding. Season Mar–Sept in Mali, Jun–Jul in Ivory Coast and Burkina Faso, Apr–May in Nigeria, Feb–Mar in Cameroon, and Jul–Aug in Sudan. Nest a simple cup of straw, placed on rock ledge in cave; nestlings fed by both parents. No other information.
Movements. Presumed resident; perhaps nomadic, as periodically absent from breeding areas in Cameroon, and flocks seen far from normal rocky habitats in Senegal.
Status and Conservation. Not globally threatened. Locally not uncommon; scarce in some areas. Wide range, but presence localized because of habitat requirements.
Bibliography. Bannerman (1948), Borrow & Demey (2001), Feare & Craig (1998), Fry *et al.* (2000), Morel (1985), Nikolaus (1987), Paludan (1936), Parelius (1967), Smith (1964).

72. Bristle-crowned Starling

Onychognathus salvadorii

French: Rufipenne de Salvadori **German**: Helmstar **Spanish**: Estornino de Salvadori

Taxonomy. *Galeopsar salvadorii* Sharpe, 1891, Turquel, Suk country, northern Kenya.
Monotypic.
Distribution. NW & S Somalia, C Ethiopia and N Kenya; possibly also E Uganda.



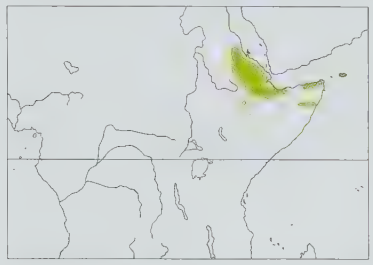
Descriptive notes. 40 cm; 160 g. Very large, dark starling with very long, graduated tail, and small "cushion" of bristly feathers on forehead (covering nostrils); also bristly feathers under chin and at corners of bill. Male is mostly dark inky black, with purple tone on head; primaries reddish-brown with black tips; tail has some greenish gloss; iris deep crimson; bill and legs black. Female resembles male, but tail shorter, has faint greenish gloss on head and throat, greyish feathers around eye and ear-coverts. Juvenile is duller than adult, with only faint gloss. Voice. Song consists of musical whistles, similar to those of *O. morio*; male sings from perch while female on nest. Chattering calls reminiscent of those of *O. tenuirostris*; alarm call a harsh "schwaah"; flight call a loud "swi-chit" or more subdued "weeo".
Habitat. Arid highlands, with cliffs and permanent water; may enter towns and gardens. Generally below 1300 m.
Food and Feeding. Primarily frugivorous; fruit and seeds reported in stomach contents. Forages in *Salvadora* bushes. In pairs and small flocks.
Breeding. Breeds Apr in Ethiopia, and May–Jun and Sept in Kenya; food-carrying adult in May in NW Somalia. Monogamous. Possibly in loose colonies in Somalia. Nest of sticks and grass, bound together with mud, placed in hole in cliff, sometimes alongside nests of congeners. No other information on wild-living individuals; in captivity, breeding successful when male excluded (previously chicks ejected from nest), but no further details provided.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Locally common in unpopulated montane regions; rather patchily distributed. Single record from Mt Moroto, in E Uganda.
Bibliography. Archer & Godman (1961), Ash & Miskell (1998), Benson (1946b), Brown (1965), Carswell *et al.* (2005), Ezra (1931), Feare & Craig (1998), Fry *et al.* (2000), Urban *et al.* (1970), Zimmerman *et al.* (1996).

73. Somali Starling

Onychognathus blythii

French: Rufipenne de Blyth **German**: Somalistar **Spanish**: Estornino Somalí
Other common names: Somali Chestnut-winged/Somali Red-winged Starling

Taxonomy. *Amydrus blythii* Hartlaub, 1859, Somalia.
Monotypic.
Distribution. Eritrea, Djibouti, NE & C Ethiopia and N Somalia; also Socotra I.



Descriptive notes. 28 cm; 100 g. Rather large, dark starling with long, graduated tail. Male plumage is mostly uniformly purple-black with some gloss; primaries reddish-brown with narrow black band near tip; iris reddish-brown; bill and legs black. Female differs from male in having crown, nape, side of head, chin, throat and breast plain ash-grey. Juvenile resembles male, but plumage duller, sooty brown, iris brown. Voice. Flight call high-pitched, musical "tleep"; harsh "scraich" alarm call; melodious and distinctive whistles also described as typical calls; "tee-tee" from flocks. Contact call of pair-members a disyllabic "di-heed".
Habitat. Primarily high mountains in arid regions, also rocky cliffs at lower altitudes. Breeds mostly above 1000 m, ranging to above 3000 m (to 3800 m in Bale Mts, in Ethiopia); down to sea-level in non-breeding season.
Food and Feeding. Diet mostly fruit and insects. Fruit of *Ficus*, *Juniperus*, *Olea* and *Dracaena cinnabari*; insects include beetles (Coleoptera), bees (Hymenoptera) and grasshoppers (Orthoptera). Nectar, and possibly pollen, of *Kniphofia* and *Lobelia* also taken. On Socotra, often perched on backs of cattle, benefiting from their flushing of prey; also removed ticks (Acarina) from the stock. Generally in small flocks of up to c. 20 individuals. Huge roosts reported occurring in deep gorges in Ethiopia.
Breeding. Season Apr in Eritrea, Apr–May and Sept in Ethiopia, and May in Somalia; Nov–Apr on Socotra on basis of presence of juveniles. Monogamous. Nest a loose structure of grass and feathers, apparently no mud, placed in hole in cliff or cave or in road embankment, sometimes on building, and even on ridge-pole of occupied tent. Clutch 4–5 eggs, greenish-blue with red speckling. No other information.
Movements. Resident, with some altitudinal movement. Seasonal visitor May–Jun to Bale Mts, in SC Ethiopia. Non-breeding visitor to coastal areas.
Status and Conservation. Not globally threatened. Common to locally abundant. Population on Socotra estimated at 33,000 individuals. Lives mainly in arid mountainous areas, where few direct threats. Occurs in several protected areas, e.g. Awash National Park and Bale Mountains National Park.
Bibliography. Archer & Godman (1961), Ash & Miskell (1998), Blanford (1870), Clouet *et al.* (1998), Fry *et al.* (2000), Gedeon & Neumann (2004), Ogilvie-Grant & Forbes (1903), Porter & Martins (1996), Ripley & Bond (1966), Ryan & Sinclair (1998), Smith (1957).

74. Socotra Starling

Onychognathus frater

French: Rufipenne de Socotra **German**: Sokotrastar **Spanish**: Estornino de Socotora
Other common names: Socotra Chestnut-winged/Socotra Red-winged Starling

Taxonomy. *Amydrus frater* P. L. Sclater and Hartlaub, 1881, Socotra.
Monotypic.
Distribution. Socotra.



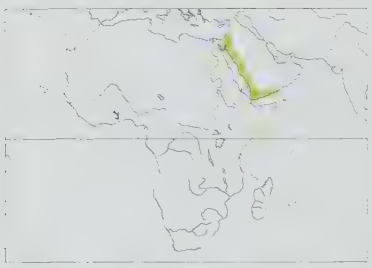
Descriptive notes. 25 cm; 100 g. Rather large, dark starling with fairly long, slightly graduated tail. Plumage is uniformly glossy black, except for reddish-brown primaries with dark brown tips; iris dark brown; bill dark brown; legs black. Sexes alike. Juvenile is sooty brown, with duller primaries, shorter tail, greyish bill. Voice. Most frequent call a clear, far-carrying whistle, "pee-hoo"; alarm a harsh "scraich"; contact call of partners a quiet monosyllabic "huid".
Habitat. Breeds and roosts in rocky areas; favours wooded areas for feeding, also visiting town gardens.
Food and Feeding. Diet mainly fruit and insects. Fruits recorded include those of *Ficus*, *Zizyphus* and *Dracaena cinnabari*; legume seeds also consumed. Insects such as ants (Formicidae) and grasshoppers (Orthoptera) taken; also snails (Gastropoda), which the starling breaks on "anvil" stones. Forages in manner of a *Turdus* thrush within vegetation, not on open ground nor in association with livestock; also enters settlements to feed on discarded scraps and refuse. In pairs and small groups.
Breeding. Nest-building and incubation observed in Nov; sightings of juveniles indicate breeding also Dec–Mar. Nest apparently a pile of grass and twigs, placed in natural cavity in roof or wall of limestone cave. No further information available. Adults are generally seen with only a single fledgling.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Socotra EBA. Population estimated at 12,000 individuals in 2003. Species' conservation status formerly rated as Vulnerable, but population currently stable, with no direct threats.
Bibliography. Clouet *et al.* (1998), Feare & Craig (1998), Fry *et al.* (2000), Gedeon & Neumann (2004), Ogilvie-Grant & Forbes (1903), Porter & Martins (1996), Ripley & Bond (1966).

75. Tristram's Starling

Onychognathus tristramii

French: Rufipenne de Tristram **German**: Tristramstar **Spanish**: Estornino de Tristram
Other common names: Tristram's Red-winged Starling, Tristram's Grackle

Taxonomy. *Amydrus Tristramii* P. L. Sclater, 1858, Mar Saaba, Hebron Valley, Israel.
Has been thought to form a superspecies with *O. morio*. Monotypic.
Distribution. E & S Israel, Palestine and W Jordan S to extreme NE Egypt (Sinai) and W Arabian Peninsula (S to Yemen).



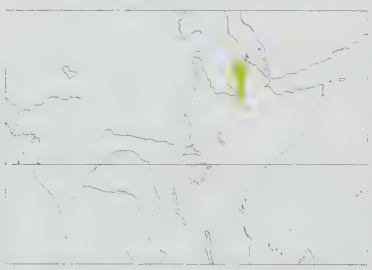
Descriptive notes. 25 cm; 115–131 g. Fairly large, dark starling with medium-length tail, rounded at corners. Male plumage is uniformly glossy black, except for reddish-brown primaries with black tips; iris very dark brown; bill blackish; legs black. Female has crown, nape, side of head, chin and throat grey, dark streaks on nape and lower throat; otherwise like male. Juvenile resembles adult male, but less glossy. Voice. Contact calls are musical whistles, e.g. "wuuwiiwuu"; harsh alarm call "veeeeh", reminiscent of that of *O. morio*. Series of soft squeaks and rasps possibly functions as song.
Habitat. Desolate rocky areas in deserts (apparently physiologically adapted to such conditions); also urban areas.
Food and Feeding. Diet mostly fruit and insects, occasionally small snails (Gastropoda), also household scraps. Fruits include those of *Ficus nitida*, *Atriplex semibaccata*, *Vitis*, *Myoporum*, *Coridia sinensis*, *Salvadora persica*, *Olea chrysophylla*, *Phoenix dactylifera* and hips of *Rosa abyssinica*. Insects include beetles (Coleoptera), grasshoppers (Orthoptera), flies (Diptera), butterflies (Lepidoptera) and bees (Hymenoptera). Also scavenges bread and dog biscuits from houses in town; those breeding outside urban areas may visit towns in order to forage. Plucks ticks (Acarina) from hides of ibex, donkeys and camels; regular grooming sites visited by Nubian ibex (*Capra ibex*) in Israel, with apparent mutual exchange of signals between bird and mammal. Reports that camels also groomed at regular sites. In pairs and small flocks; larger flocks, containing up to c. 100, outside breeding season. Roosts of several hundred (occasionally to 2000) individuals in non-breeding season.
Breeding. Breeds Mar–Jun in Israel; second broods common. Monogamous. Sometimes in loose colonies. During courtship male fed female with insects, also presented small twigs to her. Nest built by both male and female, made from grasses (no mud used) or, in urban habitat, from green tamarisk (*Tamarix*) branches and sometimes with leaves and feathers in bowl, placed in deep hole or crevice 6–21 m above ground in cliff or building; nest reused for second brood. Clutch 2–4 eggs, sky blue with scattered brown spots, concentrated at thicker end; incubation by female only, period 15–17 days; chicks fed by both parents, nestling period 28–31 days; young fed for about ten days after fledging. Infanticide noted after female lost mate while feeding chicks; replacement male killed chicks, and took over female and nest-site. In Israel, urban breeders produced average of 1·3–2·3 fledged young per pair.
Movements. Resident; also partly nomadic. Suggested that birds moved from low, hot summer breeding areas to cold N wintering areas, but no evidence of large-scale movements on seasonal basis.
Status and Conservation. Not globally threatened. Common to locally abundant. Estimated population in Israel c. 1000–2000 pairs in 1980s. Widespread in unpopulated regions, and now increasingly occupying man-modified environments. Has colonized urban areas, and now found both foraging and nesting in towns in many parts of range.
Bibliography. Amadon (1956), Bigger (1931), Cramp & Perrins (1994), Dmi'el & Tel-Tzur (1985), Gallagher & Woodcock (1980), Hofshi & Katzir (1990), Hofshi *et al.* (1987a, 1987b), Meinertzhagen (1954), Paz (1987), Shirihai (1996), Uhlig & Uhlig (1997), Yosef & Yosef (1991).

76. White-billed Starling

Onychognathus albirostris

French: Rufipenne à bec blanc **German**: Weißschnabelstar **Spanish**: Estornino Piquiblanco

Taxonomy. *Ptilonorhynchus* (*Kitta*) *albirostris* Rüppell, 1836, Ethiopia.
Monotypic.
Distribution. Highlands from S Eritrea S to C Ethiopia.



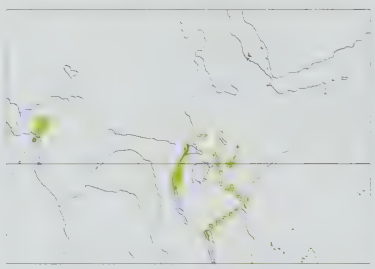
Descriptive notes. 25 cm; 130–145 g. Medium-sized, pale-billed dark starling with comparatively short tail; feathers in front of eye directed forwards along bill, covering nostrils. Male plumage is mostly glossy blue-black, with greenish gloss on wings and tail; primaries reddish-brown with narrow black tips; iris brown; bill white; legs black. Female differs from male in having crown, nape, side of head, throat and upper breast pale grey. Juvenile has dark head like male. Voice. Song intermediate between chatter and musical whistling; calls at nest repeated "kwit-kwit"; less melodious than voice of *O. morio*. Alarm call a harsh "charr".
Habitat. Rocky gorges and cliffs, between 2000 m and 3000 m; locally also in towns.
Food and Feeding. Diet fruit and insects. Fruit of *Ficus* and *Juniperus* eaten; insects include grasshoppers (Orthoptera), beetles (Coleoptera), butterfly (Lepidoptera), and winged ants (Formicidae) and other Hymenoptera. Feeds in trees; hawks insects in air. In pairs and small groups; larger flocks in non-breeding season. Communal roosts of more than 100 individuals outside breeding period.
Breeding. Breeds Aug–Oct in Ethiopia; nest-building in Jun in Eritrea. Monogamous. Nest in hole or crevice in rock, or on man-made structure, including bridge or building, sometimes on door lintel of derelict building; one nest made from grass and cereal-leaf blades, lined with plant fibres and rootlets (no mud used in construction); some nest-sites used for three successive years. Clutch 4 eggs, turquoise blue with small brown to blackish spots, mainly at thick end; incubation by female alone, chicks fed by both parents, male may bring food to female on nest; combined incubation and nestling periods estimated at 35 days. At three active nests, eight young fledged from minimum of twelve eggs.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Locally common to very common; uncommon in S of range (Bale Mts).
Bibliography. Brown & Thorogood (1976), Érard & Prévost (1971), Feare & Craig (1998), Fry *et al.* (2000), Smith (1957), Urban & Brown (1971).

77. Waller's Starling

Onychognathus walleri

French: Rufipenne de Waller **German**: Wallerstar **Spanish**: Estornino de Waller
Other common names: Waller's Chestnut-winged/Waller's Red-winged Starling

Taxonomy. *Amydrus walleri* Shelley, 1880, Usambara Mountains, Tanzania.
Three subspecies recognized.
Subspecies and Distribution.
O. w. preussi Reichenow, 1892 – SE Nigeria (Obudu Plateau), W Cameroon and Bioko I (Fernando Póo).
O. w. elgonensis (Sharpe, 1891) – S Sudan, E DRCongo, SW Uganda, W Rwanda, W Burundi, and Mt Elgon (Uganda–Kenya border) and W Kenya (W of Rift Valley).
O. w. walleri (Shelley, 1880) – Kenyan Highlands E of Rift Valley, S through Tanzanian Eastern Arc to N Malawi.



Descriptive notes. 20 cm; 73–92 g. Relatively small, dark starling with shortish round-ended tail and red eyes. Male nominate race has crown dull blue-black, nape and ear-coverts glossy black with metallic green sheen; mantle, back and rump dull blue-black; wing and tail dull blue-black, primaries reddish-brown with broad black tips (in flight, wing patch appears centrally positioned); chin and throat glossy black with metallic green sheen; underparts dull blue-black; iris deep red; bill and legs black. Female differs from male in having crown, nape, side of head, chin and throat ash-grey, nape streaked with dark metallic green, breast to undertail-coverts dull charcoal. Juvenile resembles male but lacks gloss in plumage, iris dark brown. Race *elgonensis* is shorter-winged and with flatter, broader bill than nominate, female has grey on head and throat more restricted, crown to nape and throat with heavy streaking; *preussi* is like previous in plumage, but smaller. Voice. Song a series of clear whistled notes, also some chipping and scratchy elements. Sings in groups before separating out on breeding territories. Flight-intention call a 2-note whistle; contact call a single loud whistle; harsh, grating alarm call.
Habitat. Montane forest, including isolated patches, as well as forest edge and areas of shifting agriculture. Mainly at 1000–3000 m; down to 200 m on Bioko, and to 300 m in E Usambaras (Tanzania).
Food and Feeding. Diet fruit and animal items. Fruit includes that of *Cinnamomum zeylanicum*, *Juniperus*, *Symphonia*, *Ekebergia capensis*, *Prunus africanus*, *Ocotea michelsonii*, *Ocotea usambarensis*, *Ilex mitis*, *Macaranga neomildbreadiana*, *Macaranga kilimandscharica*, *Maesa*, *Sapium ellipticum*, *Rapanea*, *Urura*, *Podocarpus latifolius*, *Harungana*, *Schefflera*, *Alangium chinense*, *Polyscias fulva*, *Allophyllus abyssinicus*, *Ficus natalensis*, *Afrocrania volkensii*, *Aphloia theiformis*, *Bersama abyssinica*, *Bridelia brideliifolia*, *Bridelia micrantha*, *Celtis africana*, *Myrica salicifolia*, *Rhus longipes*, *Trichilia dregeana*, *Xymalos monospora*. Animal food taken includes chameleons (Chamaeleonidae), spiders (Araneae); also insects, including termites (Isoptera). Forages mostly in forest canopy. Adept at gripping thin branches and thus climbing to terminal clusters of fruit. Flying insects caught on the wing; insects also collected from bark, and gleaned from foliage. In pairs and small flocks; flocks of non-breeders can contain more than 50 individuals.
Breeding. Season Nov–Dec in Cameroon; Nov and possibly Mar–Apr in E DRCongo, May in Uganda, Aug–Sept in Kenya and Aug–Nov in Malawi. Monogamous, probably with long-term pair-bond. Nest a cup made from moss, bark and dead leaves, lined with thin twigs, liana fibres and bark, materials brought in by both male and female, placed in hole 4–20 m above ground in live or dead tree. Eggs described as uniform blue-green. No information on clutch size, but 1–3 nestlings noted; incubation by female, estimated period 13–16 days; chicks fed by both sexes, nestling period 23–30 days. Productivity apparently low; predation considered major source of nesting failure in Malawi, where single-brooded and most nests appeared to produce only a single fledgling.
Movements. Presumed resident; local wandering, perhaps involving primarily flocks of non-breeders. Possible altitudinal movements in E Tanzania.
Status and Conservation. Not globally threatened. Common in many areas of range. Estimated 12 pairs in 160 ha of forest on Nyika Plateau, in Malawi, in 1980–1981. Able to utilize isolated forest patches.
Bibliography. Amadon (1956), Bannerman (1948), Basilio (1963), Borghesio *et al.* (2008), Borrow & Demey (2001), Burgess & Mlingwa (2000), Carswell *et al.* (2005), Dowsett *et al.* (2008), Dowsett-Lemaire (1983a, 1983b, 1985, 1988, 1990), Dowsett-Lemaire & Dowsett (2006), Fry *et al.* (2000), Lack (1936), Moermond (1992), Moermond *et al.* (1993), Nikolaus (1987), Sclater & Moreau (1933), Taylor & Taylor (1988), Zimmerman *et al.* (1996).

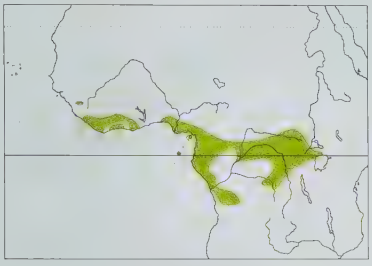
78. Chestnut-winged Starling

Onychognathus fulgidus

French: Rufipenne de forêt **German**: Kastanienflügelstar **Spanish**: Estornino Alirrufo
Other common names: Common Chestnut-winged/Forest Chestnut-winged Starling

Taxonomy. *Onychognathus fulgidus* Hartlaub, 1849, São Tomé.
Races sometimes treated as two separate species. Notable variation, but much local overlap prevents meaningful classification into more than one mainland subspecies: birds E & S from Cameroon sometimes separated as race *intermedius*, supposedly intermediate in size between nominate and *hartlaubii* and with more bluish iridescence on head; birds of Upper Guinea previously separated as race *harterti*; name *hartlaubii*, with type locality of Bioko, thus variously applied to groups of W or E, or, as here, to all mainland populations; proposed race *leoninus* (Sierra Leone) included within *hartlaubii*. Two subspecies currently recognized.
Subspecies and Distribution.
O. f. fulgidus Hartlaub, 1849 – São Tomé I, in Gulf of Guinea.

O. f. hartlaubii Hartlaub, 1858 – S Guinea, N & S Sierra Leone and Liberia E to Ghana, S Nigeria, and S Cameroon S, including Bioko I (Fernando Póo), to N Angola (E to NW Lunda Norte) and E to S Sudan (Begengai), W Uganda and NE & EC DRCongo.



Descriptive notes. 28-35 cm; 103–140 g. Large, dark starling with long, graduated tail and long, heavy bill. Male nominate race has crown glossy blue-black, nape, ear-coverts, side of head, chin and throat black with greenish gloss; mantle and back black with greenish gloss, rump with purple tone; wing and tail black with greenish gloss, primaries reddish-brown with broad black band at tips (in flight, patch appears to be centrally positioned in wing); underparts purple-black; iris red; bill black; legs black. Female differs from male in having crown, nape, chin, throat and side of head grey, heavily streaked with glossy dark green. Juvenile is duller version of male, with brown iris. Race *hartlaubii* is much smaller than nominate, with notably smaller bill, has greenish sheen on head and neck of male. VOICE. Song a mixture of low, glottal and high screechy notes, also a grating "churng-chuzick". Flight call a whistled "ti-ew", also other disyllabic variants; harsh alarm call; seldom calls when perched.

Habitat. Lowland primary forest and old secondary forest, sometimes in clearings and wooded gardens; generally below 1000 m, but frequently near hills.

Food and Feeding. Diet mainly fruit; also nectar of *Bombax*, and insects. Fruit of *Dacryodes*, *Ficus*, *Uapaca*, *Cecropia*, *Pycnanthus*, *Guibourtia*, *Trichoscypha*, *Maesopsis eminii*, *Elaeis guineensis*. Insects such as alate termites (Isoptera), beetles (Coleoptera) and winged ants (Formicidae) recorded as taken. Forages mostly in canopy; hawks insects from branches. In pairs and small groups, mainly of fewer than ten individuals. On Bioko foraged in groups with *Lamprotornis splendidus*; elsewhere with latter species and also *Hylopsar cupreocauda* and *Hylopsar purpureiceps*.

Breeding. Season Oct–Mar in Liberia, Sept–Dec in Ivory Coast, Oct–Nov in Ghana, Jan–May in Nigeria, May–Jun in Cameroon, and Sept–Nov in São Tomé; in DRCongo, Apr–Sept in N, Nov and Mar–Apr in E (Itombe region); Sept in Uganda; in breeding condition in Aug in Angola. Nest in broad base of palm fronds, among massed epiphytes or in tree hole 15–35 m above ground, sometimes in nest base of Red-necked Buzzard (*Buteo auguralis*) or of Palm-nut Vulture (*Gypohierax angolensis*), and once in underside of Crowned Hawk-eagle (*Stephanoaetus coronatus*) nest; in Liberia often near colony of Yellow-mantled Weavers (*Ploceus tricolor*); nest-site may be used in consecutive years. No other information.

Movements. Resident, but appears to be highly mobile; outside breeding season, seldom at one site for more than a few days. In Ivory Coast, pattern of occurrence suggests local seasonal migration.

Status and Conservation. Not globally threatened. Widespread, and locally common. Fairly common in W Africa; reported also from Misahöhe, in Togo, but status in that country unclear. Locally common in N Angola.

Bibliography. Amadon (1956), Bannerman (1948), Borrow & Demey (2001), Brosset & Érard (1986), Carswell *et al.* (2005), Chapin (1954), Christy & Clarke (1998, 2006), Dean (2000b), Elgood (1982), Fry *et al.* (2000), Fuggles-Couchman (1983), Gatter (1997), Germain *et al.* (1973), Grimes (1987), Herroelen (1955), de Naurois (1994), Serle (1965, 1981), Skorupa (1982), Thiollay (1970).


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cm 10
PLATE 45
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80
81
82
ssp *aeneocephalus*
83
ssp *mevesii*
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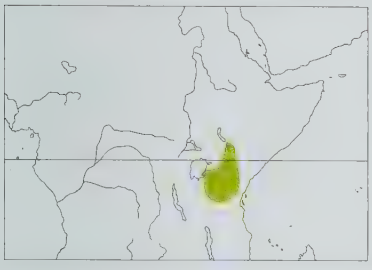
Genus *LAMPROTORNIS* Temminck, 1820

79. Hildebrandt's Starling

Lamprotornis hildebrandti

French: Choucador de Hildebrandt **Spanish**: Estornino de Hildebrant
German: Hildebrandtglanzstar

Taxonomy. *Notauges Hildebrandti* Cabanis, 1878, Ukamba, Kenya.
May form a superspecies with and formerly considered conspecific with *L. shelleyi*; both have sometimes been combined in a superspecies with *L. pulcher*. Monotypic.
Distribution. NC Kenya S to NC Tanzania.



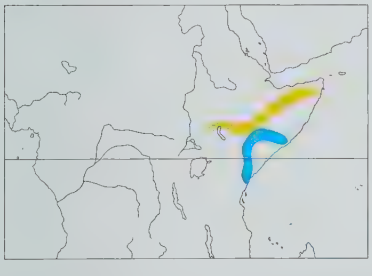
Descriptive notes. 18 cm; 50–69 g. Has forehead and crown dark glossy blue, half-collar of bronze-green on nape; upperparts dark glossy blue; wing bronze-green, lesser and median coverts blue with velvety-black subterminal spots, greater coverts with black terminal spots on inner feathers, primaries deep blue on outer webs (attenuated on primaries P5–P9, but no indentations on inner webs); tail glossy blue-green; chin, throat, ear-coverts and upper breast dark glossy purple, lower breast and upper belly light orange-buff, lower belly, flanks, thighs and undertail-coverts rufous; iris orange-red; bill and legs black. Sexes alike. Juvenile has dull charcoal-grey upperparts, some gloss on wings and tail, underparts pale chestnut-brown; iris brown, dull yellow eyering; bill dull orange-yellow. VOICE. Song a slow sequence of low notes "ch-rak ch-rak chee-chee-wee chee-wee rak rak rak" interspersed with whistles. Alarm call "chu-ee"; contact call in flocks a whistled "chule".
Habitat. Open thornbush country and open woodland between 500 m and 2200 m; also around cattle enclosures and settlements.
Food and Feeding. Diet probably mainly insects; beetles (Coleoptera) and grasshoppers (Orthoptera) noted; hawks alate termites (Isoptera). Seeds (possibly from fruit) in stomach contents; in Kenya, fed on fruit of *Carissa edulis, Euclea, Rhus, Apodytes dimidiata*. Forages primarily on ground; may make use of mammals, taking insects disturbed by these. In pairs and small flocks; often feeds in association with *L. superbus* and *L. chalybaeus*, sometimes with *Creatophora cinerea*, less often with other sturnids.
Breeding. Season Mar–May and Oct–Dec; on Laikipia Plateau, Kenya, May-Jul. Co-operative breeding reported, but species encountered primarily in pairs at one Kenya site. Nest a pad of hair or plant fibres placed in tree hole, generally old woodpecker (Picidae) hole, 1–10 m above ground, or hole in fence post, lamppost or telegraph pole used; competition for nest holes with *L. chalybaeus*. Clutch 3–4 eggs, reported as white, but possibly in error; no information on incubation and nestling periods; both sexes feed young. Nests parasitized by Great Spotted Cuckoo (*Clamator glandarius*).
Movements. Presumed resident, with no more than local movements; absent from breeding areas for several months in Kenya.
Status and Conservation. Not globally threatened. Fairly common to rather uncommon. Although sometimes regarded as uncommon, this species' habitat is not under threat, and it occurs within several protected areas.
Bibliography. Erlanger (1905), Feare & Craig (1998), Fry *et al.* (2000), Geertsema (1976), Lewis & Pomeroy (1989), Short & Horne (2005), Zimmerman *et al.* (1996).

80. Shelley's Starling

Lamprotornis shelleyi

French: Choucador de Shelley **German**: Shelleyglanzstar **Spanish**: Estornino de Shelley

Taxonomy. *Spreo shelleyi* Sharpe, 1890, Somalia.
May form a superspecies with and formerly considered conspecific with *L. hildebrandti*; both have sometimes been combined in a superspecies with *L. pulcher*. Monotypic.
Distribution. Breeds S Ethiopia and NW Somalia, probably also SE Sudan and N Kenya; non-breeding E Kenya and S Somalia.



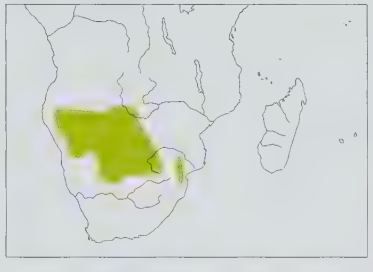
Descriptive notes. 16 cm; 45 g. Has crown, chin, throat and upper breast glossy dark purple, matt black patch from lores to ear-coverts, narrow bronzy-green collar on nape; upperparts dark glossy blue; wing bronze-green, lesser and median coverts dark blue, black subterminal spots on lesser, median and greater coverts, primaries dark purple on outer webs (attenuated on primaries P6–P8, but lack indentations on inner webs); tail glossy blue-green; underparts from lower breast down uniformly dark rufous-brown; iris orange-red; bill and legs black. Sexes alike. Juvenile has charcoal-grey upperparts, some gloss on wings and tail, pale chestnut-brown underparts, iris brown or grey-blue. VOICE. Song of short phrases combining whistles, nasal calls and scratchy sounds, described as a melange of *L. superbus* and White-browed Sparrow-weaver (*Plocepasser mahali*) songs. Contact call a disyllabic or trisyllabic "jaraanh".
Habitat. Semi-arid bushed and wooded country, especially with *Commiphora*, from sea-level to c. 1300 m; generally below 1000 m in Kenya.
Food and Feeding. Few data. Perhaps more insectivorous than frugivorous; in Kenya, common along R Tana when *Salvadora* bushes fruiting. Forages on the ground less than do *L. superbus* and *L. hildebrandti*. In small flocks; outside breeding season, flocks of up to 100 and more individuals associate with nomadic *Speculipastor bicolor*.
Breeding. Season Mar–Apr in Ethiopia; Apr–Jun in Somalia, where may be double-brooded. Nest a lining of grass and feathers in tree hole or cleft 1·5–3 m above ground; in Ethiopia, also found in termite (Isoptera) mound. Clutch 3–6 eggs, pale blue, rarely speckled with brown; in captivity, incubation by female while male sang from nearby perch, chicks fed by both parents, nestling period 22–23 days. No other information.
Movements. Migratory; some perhaps sedentary within breeding areas. Moves N into Ethiopia and Somalia in Mar–Apr to breed; in Kenya, non-breeding visitor Oct–Mar. In Tsavo East National Park, in Kenya, recorded only in Nov and Feb–Mar, suggesting regular movements also within non-breeding range.
Status and Conservation. Not globally threatened. Locally common to very common within small breeding range. Appears to be rather uncommon in much of non-breeding range. Habitat occupied by this species is unsuitable for large-scale settlement or agriculture.
Bibliography. Archer & Godman (1961), Ash & Miskell (1983), Benson (1946b), Fry *et al.* (2000), Lack (1985), Lewis & Pomeroy (1989), Nikolaus (1987), Scamell (1964), Zimmerman *et al.* (1996).

81. Burchell's Starling

Lamprotornis australis

French: Choucador de Burchell **German**: Riesenglanzstar **Spanish**: Estornino de Burchell
Other common names: Burchell's Glossy/Greater Glossy Starling

Taxonomy. *Megalopterus australis* A. Smith, 1836, country north of Kurrichane, North West Province, South Africa. Monotypic.
Distribution. S Angola S to C & E Namibia, E to SW Zambia, NW Zimbabwe, Botswana, N South Africa and Swaziland.



Descriptive notes. 30 cm; 74–138 g. Comparatively robust with long, graduated tail, and dark eye. Has forehead and crown to mantle and back blue-green, distinct blue-purple sheen on nape (almost forming a collar on some individuals), rump and uppertail-coverts purple with bronzy tinge; ear-coverts and patch below eye bronze, fringed with blue, often appearing matt-black and, together with black lores, contrasting sharply with very glossy surrounding feathers; flight-feathers with blue-purple sheen and strong cross-barring, long, graduated tail violet with strong barring; chin, throat and breast blue-green, purple shading in centre of belly; flanks, thighs and undertail-coverts bluish; iris dark brown; bill and legs black. Contrasting dark mask and often partly exposed dark centres of upperwing-coverts and scapulars help to separate from *L. mevesii*. Sexes alike. Juvenile has matt black underparts, dull green sheen on upperparts. VOICE. Song an extended, harsh croaking with pauses between groups of notes; a throaty, musical call given by perched birds, perhaps as territorial display.
Habitat. Open woodland and savanna, avoiding miombo woodland; associated particularly with camelthorn trees (*Acacia erioloba*) or knobthorn (*Acacia nigrescens*). To 1500 m; below 500 m in E lowveld of South Africa.
Food and Feeding. Diet includes fruit, such as *Diospyros mespiliformis*, and flowers of *Acacia giraffae*; also animal food, ranging from small mice (Muridae) to centipedes (Chilopoda), locusts (Acrididae), beetles (Coleoptera), termites (Isoptera) and ants (Formicidae). Scavenges at picnic sites in national parks; attracted to balchatri traps baited with mice (traps set for raptors). Forages mainly on ground, walking with long strides; often alongside *L. nitens* and *L. chalybaeus*, or *L. mevesii*. In pairs and groups, sometimes in larger flocks; in non-breeding season, roosts of up to 1000 individuals in tall trees, also in reedbeds.
Breeding. Breeds Mar in Zambia, Jan–Apr in Namibia and Botswana, and Sept–Mar (mostly Oct–Jan) in South Africa. Monogamous. Nest built by both sexes, with grass, sometimes fresh green leaves, feathers, shed snakeskin, dry dung, also artificial material (string, cloth, paper, strips of plastic), placed 2–7 m above ground in tree hole, either natural hole or old hole of woodpecker (Picidae) or barbet (Capitonidae), or in rock crevice, building or even tower of windmill; nestbox accepted where available; hole often reused in successive years. Clutch 2–4 eggs, bright blue to greenish-blue, plain or with sparse reddish-purple spots; incubation by female only, period c. 15 days; chicks fed by both parents, nestling period 20–24 days. Brood parasitism by Great Spotted Cuckoo (*Clamator glandarius*) recorded in Namibia, Botswana and South Africa, but young of present species may be raised successfully alongside single cuckoo chick; nests occasionally parasitized by Greater Honeyguide (*Indicator indicator*).
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Locally common. Wide range in sparsely populated areas; common in some national parks. Population in Kruger National Park, South Africa, estimated at over 16,000 birds and that of Kgalagadi Transfrontier Park, on SW Botswana–South Africa border, at more than 4000. Reports of this species from Mozambique require corroboration.
Bibliography. Brooke (1967b, 1968a), Craig (2000), Craig & Herremans (1997b), Dean & Macdonald (1972), Dean *et al.* (1987), Dowsett *et al.* (2008), Fry *et al.* (2000), Hockey *et al.* (2005), Hoesch & Niethammer (1940), Hopkinson (1932), Kemp, Herholdt *et al.* (2001), Kemp, Kemp *et al.* (1972), McCarthy (2006), Parker (1999), Pickles (1989), Tarboton *et al.* (1987).

82. Long-tailed Glossy Starling

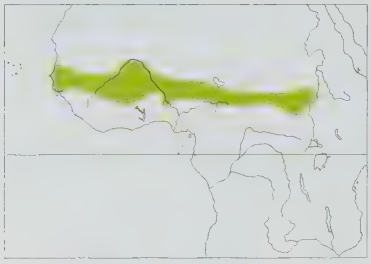
Lamprotornis caudatus

French: Choucador à longue queue **Spanish**: Estornino Colilargo
German: Langschwanz-Glanzstar

On following pages: 83. Rüppell's Glossy Starling (*Lamprotornis purpuroptera*); 84. Meves's Long-tailed Starling (*Lamprotornis mevesii*); 85. Ashy Starling (*Lamprotornis unicolor*); 86. Splendid Glossy Starling (*Lamprotornis splendidus*); 87. Principe Glossy Starling (*Lamprotornis ornatus*); 88. Golden-breasted Starling (*Lamprotornis regius*); 89. Superb Starling (*Lamprotornis superbus*); 90. Chestnut-bellied Starling (*Lamprotornis pulcher*); 91. African Pied Starling (*Lamprotornis bicolor*); 92. White-crowned Starling (*Lamprotornis albicapillus*); 93. Fischer's Starling (*Lamprotornis fischeri*).

Other common names: Supple-tailed Glossy Starling

Taxonomy. *Turdus caudatus* Statius Müller, 1776, Senegal.
Forms a superspecies with *L. purpuroptera* and *L. mevesii*. Monotypic.
Distribution. S Mauritania, Senegambia, Guinea-Bissau and N Guinea E in narrow band (semi-arid belt) to S Chad, N Central African Republic and W & EC Sudan.



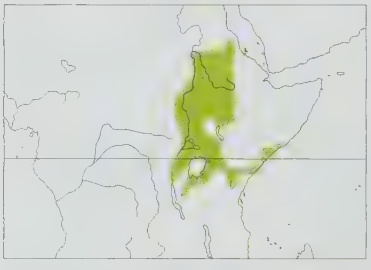
Descriptive notes. c. 40–50 cm, including tail of up to 33 cm; 103–133 g. Large glossy starling with extremely long, strongly graduated, supple tail, rectrices paired in step-like fashion. Has crown, side of head and chin blue-green with bronze sheen; nape, mantle and back have blue-green gloss, rump blue-violet with purple gloss; wing blue-green, prominent velvety-black spots near tips of scapulars and wing-coverts; tail purple with dark cross-barring; throat and breast glossed blue-green, belly, flanks, thighs and undertail-coverts blue-violet with central bronzy patch; iris creamy white; bill and legs black. Sexes alike in plumage, male clearly larger than female. Juvenile lacks gloss of adult, has dark iris for at least one year. Voice. Common call a sing-song "elekele", and coughing "chuc-chu-chu". Raucous alarm calls recognized by other species in foraging groups.
Habitat. Park-like savanna woodland, farmland, well-wooded residential areas, thorn-thickets and wooded hills surrounded by cultivation.
Food and Feeding. Diet fruit, such as *Azadirachta indica*, and insects, including terrestrial and winged ants (Formicidae) and alate termites (Isoptera). Forages mainly on ground, while hopping and walking; also in trees. In small flocks. In Senegal, apparent leader of mixed-species foraging groups which typically included Red-billed Hornbills (*Tockus erythrorhynchus*), Hoopoes (*Upupa epops*), Senegal Coucals (*Centropus senegalensis*) and Yellow-billed Shrikes (*Corvinella corvina*). Communal roosts and groups of more than ten individuals only in non-breeding season.
Breeding. Season Sept–Nov in Senegal and Gambia, Aug–Oct in Mali, Jun in Burkina Faso and Niger, Sept–Oct in Nigeria and Sept–Oct in Sudan. Monogamous; breeds in group, all members of which defend territory and co-operate in rearing of young. Nest a lining of leaf spines placed in tree hole. Clutch 3–4 eggs, plain blue; incubation by female alone in captivity, no information on duration of incubation period; chicks fed by both parents and by helpers (both in captivity and in wild), captive female apparently dominant at nest, taking food brought in by other group-members, which fed chicks directly only in her absence; nestling period c. 21 days.
Movements. Mainly resident. Local movement during dry season.
Status and Conservation. Not globally threatened. Not uncommon to common; common in most parts of range. Widely distributed, and utilizes man-modified habitats.
Bibliography. Bannerman (1948), Bates (1934a), Borrow & Demey (2001), Fry *et al.* (2000), McCarthy (2006), Moynihan (1978), Nikolaus (1987), Schifter (1986), Serle (1943b), Shuel (1938), Wilkinson (1988).

83. Rüppell's Glossy Starling

Lamprotornis purpuroptera

French: Choucador de Rüppell **German**: Schweifglanzstar **Spanish**: Estornino de Rüppell
Other common names: Rüppell's Long-tailed Glossy Starling

Taxonomy. *Lamprotornis purpuroptera* Rüppell, 1845, Shoa district, south-western Ethiopia.
Forms a superspecies with *L. caudatus* and *L. mevesii*. Two subspecies recognized.
Subspecies and Distribution.
L. p. aeneocephalus Heuglin, 1863 – E & SE Sudan, NW Eritrea and W Ethiopia.
L. p. purpuroptera Rüppell, 1845 – S Ethiopia, NE DRCongo, Uganda, Rwanda, Burundi, W & S Kenya, SE Somalia, and NW & NE Tanzania.



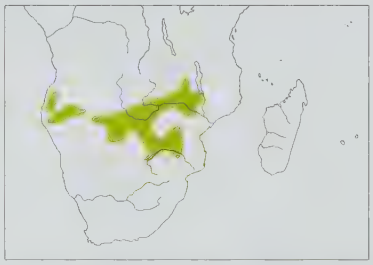
Descriptive notes. 35 cm; 78–92 g. Large glossy starling with long, graduated tail. Nominate race has crown, chin and side of head blue-green with bronzy sheen, nape blue with purple sheen, mantle and back blue, rump purple; wing blue-green, dark barring on coverts, tertials and outer webs of primaries; tail purple with distinct bars; throat and breast blue-green; belly, flanks, thighs and undertail-coverts purple, bronzy sheen in centre of belly; some individuals have plumage predominantly purple with bronzy sheen; iris creamy white; bill and legs black. Sexes alike in plumage, but differ in mouth colour: dark in males, pale pinkish in females. Juvenile is matt black, with some gloss on crown, mantle and wings, iris dark brown. Race *aeneocephalus* is much larger than nominate, with longer and more graduated tail, and with mantle, back and upper breast more violet, wings more blue (less greenish). Voice. Song a long warbling, relatively musical series consisting of both sweet notes and harsh ones, with some mimicry, each strophe containing 4–10 elements "pa-wee pweet pweet tcheeeoh"; duetting by partners common, male starting and female following. Often extended periods of song during heat of day. Various call notes reported, e.g. "swi-chew" and "kwerr". Also audible wing sounds during interactions with other birds.
Habitat. Grassland with scattered trees and bushes, in arid areas usually near water; occurs at up to 2000 m. Common in cultivated lands and urban areas in Uganda.
Food and Feeding. Described as almost omnivorous; collects food scraps at camp sites. On Laikipia Plateau, Kenya, ate fruit of *Euclea divinorum*, *Ficus*, *Strychnos henningii* and flowers of *Apodytes dimidiata*; insect food included termites (Isoptera). Forages predominantly on ground, where it hops and runs. In pairs and in small groups.
Breeding. Breeds Oct–Dec in Sudan, Mar–Jul in Ethiopia and Eritrea, Aug–Nov in Rwanda, mainly Mar–May in W Kenya and Uganda, Apr–Jul on Laikipia Plateau, Kenya, and Oct–Nov in E Kenya and Tanzania; at Nakuru, in SW Kenya, no clear breeding season, pairs following own individual cycles (hormonal levels revealed no seasonal pattern in this population); newly fledged young in Jul in Somalia. Monogamous; co-operative breeding in some populations, perhaps dependent on ecological conditions. Nest in tree hole 2·5–25 m above ground, or in old hole of woodpecker (Picidae) in *Hyphaene* palm, cavity lined with cow dung and twigs; in captivity, built nest of leaves, rootlets and mud inside nestbox. Clutch 3 eggs, plain blue to bluish-green, or with rusty spots and blotches; in captivity, incubation period c. 14 days, chicks fed mostly by female, nestling period 25 days; in Kenya both parents reported to incubate, both fed young, and helpers at some nests were older siblings of nestlings.
Movements. Presumed resident in most areas; may also be nomadic. Ringed individual in Ethiopia recovered 9 years later, 37 km from capture site.
Status and Conservation. Not globally threatened. Common within most parts of its range; considered the commonest starling species in Uganda. Occurs within many E African protected areas. Old records of possible breeding in NW Somalia.
Bibliography. Amadon (1956), Ash (1994), Ash & Miskell (1998), Benson (1946b), Carswell *et al.* (2005), David & Gosselin (2002a), Dittami (1987), Dyer (1971), Ezra (1933), Fry *et al.* (2000), Jackson & Sclater (1938), McCarthy (2006), Nikolaus (1987), Njoroge *et al.* (2008), Short & Horne (2005), Smith (1957), van Someren (1916), Wickler (1966), Zimmerman *et al.* (1996).

84. Meves's Long-tailed Starling

Lamprotornis mevesii

French: Choucador de Meves **German**: Mevesglanzstar **Spanish**: Estornino de Meves
Other common names: Long-tailed Purple Starling; Angola Glossy Starling (*benguelensis*)

Taxonomy. *Juida Mevesii* Wahlberg, 1856, Okavango River, Botswana.
Forms a superspecies with *L. caudatus* and *L. purpuroptera*. Distinctive race *benguelensis* possibly represents a separate species, differing from others in plumage and habitat; further study required. Three subspecies recognized.
Subspecies and Distribution.
L. m. benguelensis Shelley, 1906 – SW Angola (Benguela S to Namibe).
L. m. violacior Clancey, 1973 – SW Angola (C & S Huila S to Cunene and W Cuando Cubango) and NW Namibia.
L. m. mevesii (Wahlberg, 1856) – extreme SE Angola, extreme NE Namibia, N Botswana, S & E Zambia, S Malawi (R Shire), Zimbabwe (except highlands), W & SW Mozambique and extreme N South Africa (N Limpopo Province).



Descriptive notes. 30 cm; 56–77 g. Fairly large starling with long, strongly graduated tail, central rectrices clearly longest. Nominate race has lores and ear-coverts blackish, often with purple or blue-green gloss on ear-coverts; forehead, crown, nape and mantle blue-green with some purple overtones; back purple, rump bronze, uppertail-coverts purple; wing blue-green, purple sheen on outer webs of primaries, all remiges with faint cross-barring, some wing-coverts with dark blue centre surrounded by blue-green margin; tail blue-violet with heavy dark barring; chin, throat and breast blue-green with slight purple gloss; centre of belly bronze, bordered by purple on flanks and undertail-coverts, thighs blue with purple tone; iris dark brown; bill and legs black. Less contrasting mask, and long, narrow, rounded central rectrices help to separate from *L. australis*. Sexes alike, but female may be duller than male. Juvenile has matt black underparts, some sheen on dorsal plumage. Race *violacior* differs from nominate in having crown to mantle, side of neck, throat and breast strongly violet, violet-blue gloss on wing; *benguelensis* is distinctive, has entire upperparts bronzy green, tail coppery, underparts dark bronzy green, tinged violet on throat and breast. Voice. Song a churring "chwiri-chwirrchwee-chwirr chowee". Harsh "tssac" in alarm.
Habitat. Open woodland with tall trees such as acacias (*Acacia*), mopane (*Colophospermum*) and baobabs (*Adansonia*) with bare ground between, often in seasonally flooded areas; to 1300 m. SW Angolan race *benguelensis* exhibits habitat preference for miombo (*Brachystegia*) woodland, rather than mopane or acacia woodland.
Food and Feeding. Diet chiefly insects, also some fruit. Insects recorded are termites (Isoptera), beetles (Coleoptera), ants (Formicidae), mole-crickets (Gryllotalpidae), and nymphs of psyllids (Psylloidea); fruit such as *Diospyros mespiliformis*, also fruit or flowers of *Acacia albida*. Forages primarily on ground; observed to follow moving African elephants (*Loxodonta africana*), catching insects disturbed by the mammals. In pairs and small flocks; larger flocks of up to 150 individuals outside breeding season, when also large communal roosts in thorn trees noted in Botswana, Zambia and Zimbabwe.
Breeding. Breeds Apr in Angola, Feb in Botswana, Feb–Mar in Zambia, Dec–Mar in Malawi, Nov–Apr in Zimbabwe, and Dec–Mar in South Africa; sometimes double-brooded. Monogamous. Solitary nester; one report of three pairs nesting in single large tree. Nest a simple lining of vegetable matter, placed in hole up to 4 m above ground in baobab, mopane or *Hyphaene* palm, recorded also as utilizing cavity in fence post and ventilation pipe; female may partly excavate cavity in soft wood; nestbox also used. Clutch 3–4 eggs, plain blue; incubation by female alone, period 18 days; chicks fed by both parents, in captivity nestling period 23 days. Nests parasitized by Great Spotted Cuckoo (*Clamator glandarius*) in Zambia, Botswana, Zimbabwe and South Africa; in one case, when nestbox used, cuckoos were attacked and cuckoo egg successfully ejected by starlings.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Locally common in Angola and Namibia; common to locally very common in E parts of range (e.g. river valleys in Zambia). Present in major national parks, although marginal in Kruger National Park, in South Africa, with estimated population of fewer than 300 individuals, minimum of 500 birds in adjacent SW Mozambique, whereas population in CW Mozambique estimated as exceeding 100,000 individuals. Occurs primarily in thinly populated areas.
Bibliography. Amadon (1956), Benson (1953), Berry (1976), Borrett (1973), Brooke (1965a, 1967a, 1971), Colebrook-Robjent & Greenberg (1976), Craig (2000), Craig & Herremans (1997c), Dean (2000b), Dean & Macdonald (1981), Dean *et al.* (1987), Dowsett (1967), Dowsett *et al.* (2008), Fry *et al.* (2000), Gargett (1984), Guy (1976), Herremans-Tonnoeyr *et al.* (1995), Hockey *et al.* (2005), Irwin & Benson (1967), Jubb (1952), Kemp *et al.* (2001), Parker (1999, 2005), Penzhorn & Cassidy (1985), Richard (1975), Thomson (1975), Wilson (1975).

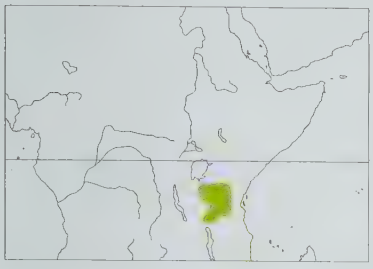
85. Ashy Starling

Lamprotornis unicolor

French: Choucador cendré **German**: Grauglanzstar **Spanish**: Estornino Cenizo

Taxonomy. *Cosmopsarus unicolor* Shelley, 1881, Ugogo, Tanzania.

This species and *L. regius* sometimes placed in a separate genus, *Cosmopsarus*; has alternatively been placed in genus *Spreo*. Monotypic.
Distribution. Interior of Tanzania.



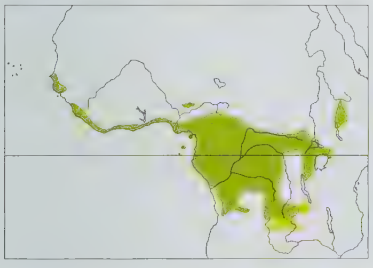
Descriptive notes. 30 cm; 55–66 g. Medium-sized, slender, uniformly coloured starling with very long, narrow tail. Plumage is a uniform ashy grey, with oily-green sheen on remiges and rectrices, some cross-barring visible on rectrices; blackish mask on lores and around eye, often extending over ear-coverts; iris pale cream with maroon-brown to dark sepia-brown inner ring; bill and legs black. Sexes alike. Juvenile is dull ashy brown with pale brown feather tips, iris dark brown, bill horn-coloured. Voice. Song of low conversational notes and harsher elements; often a repeated phrase. Alarm call a harsh "charr"; common contact call 2 squeaky notes, "kuri, kiwera"; also other longer calls.
Habitat. Open dry woodland and wooded grassland, at 1100–1800 m.
Food and Feeding. Diet largely insects; some fruit taken. Insects including termites (Isoptera), grasshoppers (Orthoptera), mantids (Mantodea), dragonflies (Odonata), lacewings (Neuroptera) and caterpillars (Lepidoptera); berries of *Cordia* and *Commiphora* found in some stomach contents; kitchen scraps eaten, including rice and porridge. Forages on ground, in pairs and small flocks.
Breeding. Breeds Feb–Mar. Monogamous; members of one pair bred together for at least 4 successive years. Co-operative breeding regular, helpers being offspring from previous broods (one helped parents in third and fourth years); each of four nests in Tanzania had one or two helpers. Nest in hole 5–16 m above ground in baobab or other tree, or in palm, often old hole of barbet (Capitonidae) or woodpecker (Picidae), into which dry grass carried; captives used nestbox, forming a cup in peat lining, but no other material added. Clutch 3–4 eggs, pale greenish-blue with brown speckles and reddish-brown spots; incubation period in captivity 14 days; chicks fed by both parents and by helpers, in captivity nestling period 26–31 days.
Movements. Presumed resident; some coastal records may represent dry-season movement.
Status and Conservation. Not globally threatened. Common within limited range. Occurs in several national parks.
Bibliography. Baker & Howell (1992), Brown & Britton (1980), Fry *et al.* (2000), Fuggles-Couchman (1939, 1984), Thomas (1960), Wilkinson & McLeod (1991), Zimmerman *et al.* (1996).

86. Splendid Glossy Starling

Lamprotornis splendidus

French: Choucador splendide **German**: Prachtglanzstar **Spanish**: Estornino Espléndido

Taxonomy. *T[urdus] splendidus* Vieillot, 1822, Malimbe, Cabinda, Angola.
Races *bailundensis* intergrades with nominate in N Angola (Malanje). Four subspecies recognized.
Subspecies and Distribution.
L. s. chrysonotis Swainson, 1837 – from Senegal E along coast to S Togo.
L. s. splendidus (Vieillot, 1822) – S Benin, Nigeria, Príncipe I (in Gulf of Guinea) and C & S Cameroon E to S Sudan and W Ethiopia, S to PRCongo, N Angola, C DRCongo, Uganda, W Kenya, Rwanda, Burundi and NW Tanzania.
L. s. lessoni (Pucheran, 1859) – Bioko I (Fernando Póo).
L. s. bailundensis (Neumann, 1920) – N & E Angola, S DRCongo and Zambia.



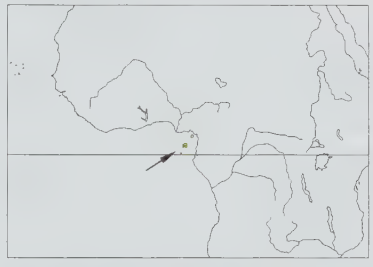
Descriptive notes. 28 cm; 111–155 g. Large glossy starling with brilliant iridescence, medium-length tail. Male nominate race has crown glossy blue-green, sharply demarcated from glossy green nape and mantle; back iridescent blue, tinged with purple, rump glossy blue-green, some barring on tips of uppertail-coverts; wing glossy green, wing-coverts with large subterminal blue spots and blue tips, secondaries and tertials have blue tips and dark purple outer webs, primaries P6–P9 have large notch on inner vane; tail feathers purple at base, broad terminal band of blue-green; small triangular golden-bronze patch between ear-coverts and throat; chin, throat, breast and upper belly purple with bronze sheen, passing into violet on flanks; thighs purple, lower belly and undertail-coverts iridescent blue; iris yellowish-white; bill and legs black. Female resembles male in pattern, but duller, with crown green, not contrasting with nape, no purple gloss and blue wash on back, bronze on underparts restricted to centre of belly, purple below partly replaced by blue. Juvenile initially has gloss only on wing and tail feathers, with belly matt grey, iris brown. Race *lessoni* is like nominate but larger; *chrysonotis* has green crown and blue (rather than purple) throat; *bailundensis* has crown, nape and back uniformly green, and blue (not green) lesser wing-coverts. Voice. Song loud, sounding (to human ear) strongly discordant, containing various gurgling, creaking and plopping sounds, including imitations of other bird species and of primates. Birds often sing in chorus from large trees during hottest period of day, also at roosts. Harsh alarm calls, ringing flight calls also reported. Captives produced accurate mimicry of human voice. Also loud wing noise in flight, has been likened to sound of distant churning of a stern-wheel steamer.
Habitat. Primary and secondary lowland forest, including isolated forest patches and gallery forest; parks and gardens with tall trees; mangroves on offshore islands, and plantations and disturbed habitats. Sea-level to 2000 m; to 2300 in E Africa. On Príncipe I restricted to lowland forest, plantations and farmland.
Food and Feeding. Diet predominantly fruit, also insects; occasionally other animals, including frogs, lizards and snails (Gastropoda). Fruits recorded as eaten include those of *Ficus*, *Pycnanthus*, *Rauwolfia*, *Dacryodes*, *Polyalthia*, *Trichoscypha*, *Coelocaryon*, *Xylopia*, *Beilschmiedia*, *Musanga*; insects such as beetles (Coleoptera), grasshoppers (Orthoptera), termites (Isoptera), ants and wasps (Hymenoptera). Apparently entirely arboreal, foraging mainly in canopy above 30 m, but sometimes descending to lower bushes. In small flocks; joins mixed-species flocks of frugivores when feeding.
Breeding. Breeds Dec–May in much of W Africa; Jan–Mar (in breeding condition also in Jul and Dec) in Gabon; in breeding condition Aug–Sept in Angola; Jan–Aug (peak Feb–Apr) in E Africa, but Nov–Mar in Rwanda; Sept–Nov in Zambia and S DRCongo. Monogamous. Nest a lining of grass, twigs, stems of creepers, or leaf petioles, placed in tree hole at height ranging from 2 m to 37 m; site may be reused in successive years. Clutch 2 eggs, blue-green spotted with red; both in captivity and in wild, female alone incubates eggs while male perches nearby, and both sexes feed nestlings; in captivity, incubation and nestling periods each c. 18 days. Competition for nest-holes with Cinnamon Rollers (*Eurystomus glaucurus*) resulted in destruction of some eggs of present species.
Movements. Primarily resident, with some local movements. Presumed resident on Bioko I, but irregular visitor on Príncipe. Large dry-season roosts in Gabon, from which birds disperse over radius of 15–20 km; similar concentrations with daily dispersal reported from Nigeria and Cameroon, but no clear evidence of seasonal movements, and considered nomadic over a large area. In Ghana and Togo resident in forested zone; local movements evident in Benin. In Uganda mainly resident, with seasonal changes in abundance; in Kenya apparently a breeding migrant, and in Zambia absent during Feb–Jun. Large flocks throughout presence in Zambia suggest that much of visiting population does not breed there; possible that only S race *bailundensis* is migratory, breeding on S margins of range, and then returning to non-breeding areas in Congo Basin.
Status and Conservation. Not globally threatened. Common to not uncommon in W Africa, where locally very common; common in Angola; common to locally very common in Ethiopia; generally uncommon in extreme E parts of range. Has extensive breeding range and is highly mobile; roosts in Gabon reported as holding tens of thousands of individuals. In early years of 20th century was collected on a large scale for plumage, but direct persecution no longer a factor.
Bibliography. Amadon (1956), Anciaux (2002), Basilio (1963), Bates (1909), Benson (1982), Borrow & Demey (2001), Brosset & Érard (1986), Carswell *et al.* (2005), Chapin (1954), Christy & Clarke (1994, 1998, 2006), Dean (2000b), Dowsett *et al.* (2008), Fry *et al.* (2000), Gatter (1997), Marchant (1953), de Naurois (1983, 1994), Nikolaus (1987), Penry (1979), Pettet (1975), Prigogine (1983), Prigogine & Benson (1979), Sawyer (1982).

87. Principe Glossy Starling

Lamprotornis ornatus

French: Choucador de Principé **German**: Prinzenglanzstar **Spanish**: Estornino de Príncipe

Taxonomy. *Sturnus ornatus* Daudin, 1800, Príncipe Island.
Monotypic.
Distribution. Príncipe I, in Gulf of Guinea.



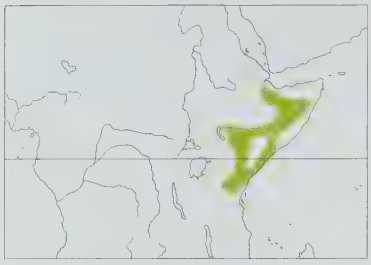
Descriptive notes. 30 cm; 130 g. Large, iridescent starling with medium-length tail. Male has crown, nape and upper mantle glossy bluish-green, back and rump glossy golden-bronze with violet margins of feathers, uppertail-coverts turquoise, tinged with violet; lores blackish, ear-coverts violet, cheek green tipped with turquoise; upperwing with lesser coverts turquoise with violet centres, greater coverts velvety black with violet tips, secondaries and tertials golden-bronze with dark barring, primaries black with turquoise and violet tips and margins, conspicuous notches on inner webs of primaries P6–P9; tail dark bronzy black with some cross-barring, tips of feathers violet and turquoise; chin, throat, breast and belly dark coppery-green, becoming dark glossy green with purplish tinge on flanks and thighs, undertail-coverts deep violet-blue; iris white; bill and legs black. Female resembles male in pattern but less glossy, greener on head and mantle, more blue on rump and tail. Juvenile has some sheen on upperparts, underparts matt grey. Voice. Song of short, disjointed phrases, apparently similar to that of *L. splendidus*, notes also likened to those of orioles (*Oriolus*). Probable alarm call a loud caw; musical "tu-ping" may be contact call. Loud swishing wing noise in flight.
Habitat. Forest, also plantations and disturbed habitats; at low and medium altitudes. When *L. splendius* present, appears generally to retreat to higher forests.
Food and Feeding. Diet apparently fruit, with some animal food. Fruit taken includes bananas, *Ficus*, *Dacryodes* and berries of *Dracaena draco*; animal items spiders (Araneae), small snails (Gastropoda), and caterpillars (Lepidoptera), termites (Isoptera) and other insects. Forages primarily in trees. Hawks termite alates in air. In pairs and in small groups of up to ten individuals; sometimes in flocks with *L. splendius*.
Breeding. Breeding reported in Jan–Feb and nest-building noted in Sept. Nest in tree hole, one 10 m above ground; both sexes seen to carry material. No other information.
Movements. Resident.
Status and Conservation. Not globally threatened. Restricted-range species: present in Príncipe EBA. Common; one of the commonest bird species on the island. Might perhaps be vulnerable to deforestation.
Bibliography. Bannerman (1948), Christy & Clarke (1998, 2006), Feare & Craig (1998), Fry *et al.* (2000), Jones & Tye (1988), de Naurois (1983, 1994), Snow (1950).

88. Golden-breasted Starling

Lamprotornis regius

French: Choucador royal **German**: Königsglanzstar **Spanish**: Estornino Pechidorado
Other common names: Regal Starling

Taxonomy. *Cosmopsarus regius* Reichenow, 1879, Massa, Tana River, Kenya.
This species and *L. unicolor* sometimes placed in a separate genus, *Cosmopsarus*. Proposed race *magnificus* (described from Tsavo, in S Kenya) appears inseparable from birds in rest of species' range. Monotypic.
Distribution. S & E Ethiopia, Somalia, E Kenya and NE Tanzania.
Descriptive notes. 30 cm; 46–63 g. Highly distinctive, colourful starling with very long, narrow, graduated tail. Has crown, nape, chin, throat and cheek glossy greenish-blue, lores and ear-coverts turquoise; mantle and back greenish-blue, glossed with purple, rump turquoise blue; upperwing greenish-blue, small dark terminal spots on wing-coverts (often visible only at close range), primaries P6–P9 strongly indented on inner web; tail bronze with faint transverse barring; breast has purple patch in shape of half-moon, passing into blue towards throat; remainder of breast and flanks, belly, thighs and undertail-coverts golden-yellow, underwing-coverts golden-yellow; iris white; bill and legs black. Sexes alike in plumage, female on average shorter-tailed than male. Juvenile has head, throat and breast matt grey, some greenish gloss on back and rump, violet gloss



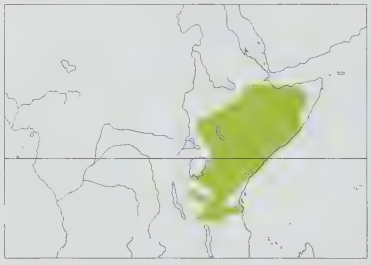
on remiges and rectrices, underparts buffy yellow, iris dark brown, bill and legs dark brown. Voice. Song, often from tree during heat of day, an extended warbling. Alarm call harsh "chairr"; flight call "cheeo cheeo".
Habitat. Dry bush and savanna in arid and semi-arid regions; sea-level to c. 1200 m, generally below 1000 m.
Food and Feeding. Diet consists primarily of insects, also some fruit of *Commiphora* and *Dobera*. Insects include beetles (Coleoptera), ants (Formicidae), caterpillars (Lepidoptera) and termites (Isoptera). In Tsavo, in S Kenya, 76% of 394 food items were insects, 97% of them collected on the ground. Forages mainly on ground; also searches foliage and hawks flying insects. Often in small groups or loosely associated with *L. fischeri*.
Breeding. Season Mar–May in Ethiopia, Apr–Jun in Somalia, Mar–May and Nov–Dec (during both rainy seasons) in Kenya; may be double-brooded. Monogamous; co-operative breeder, up to nine adults attending some nests. Nest in tree hole, either natural hole or disused hole of barbet (Capitonidae) or woodpecker (Picidae), 3–7 m above ground, lined with dry grass, animal hair, feathers, leaves and sometimes shed snakeskins, material brought in by both parents and by helpers; in captivity used nestbox, lined with leaves, moss and, finally, feathers. Clutch 3–4 eggs, pale greenish-blue with fine reddish-brown speckles; incubation by female, fed at nest by male and helpers, in captivity incubation period 14 days; young fed by both parents and by helpers, at Kenyan nests female solicited food from helpers and then fed chicks, in captivity nestling period 19–22 days.
Movements. Presumed resident; some fluctuation in numbers (as in Tsavo region of Kenya) suggests local movements in dry season.
Status and Conservation. Not globally threatened. Common. Inhabits thinly populated regions, and common in national parks within its range.
Bibliography. Bell, K. (1984), Benson (1946b), Boosey (1959), Fry *et al.* (2000), Huels (1981), Lack (1985), Lack & Quicke (1978), McCarthy (2006), Risdon (1990), van Someren (1956), Wavertree (1930).

89. **Superb Starling**

Lamprotornis superbus

French: Choucador superbe **German**: Dreifarben-Glanzstar **Spanish**: Estornino Soberbio

Taxonomy. *Lamprocolius superbus* Rüppell, 1845, Shoa, Ethiopia.
Monotypic.
Distribution. SE Sudan, NE Uganda, S, C & E Ethiopia, Somalia (except NE) and Kenya S to C Tanzania.



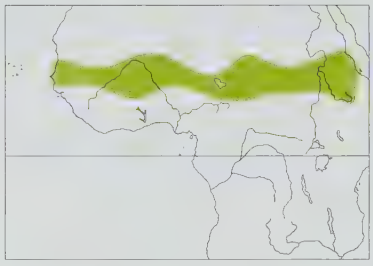
Descriptive notes. 18 cm; 52–77 g. Small, short-tailed starling with distinctive plumage pattern. Crown and ear-coverts are bronzy black, nape, mantle, back and rump glossy blue-green, nape with blue tone; upperwing glossy metallic green, dark velvety black spots on tips of coverts, inner web of primaries P6–P9 indented, outer web of primaries P5–P8 attenuated; tail glossy blue-green; chin, throat and breast glossy blue-green, separated by narrow white band from chestnut-brown belly, flanks and thighs; undertail-coverts and underwing-coverts white; iris creamy white; bill and legs black. Sexes alike. Juvenile is much duller than adult, lacking gloss on wing and tail, although plumage pattern still clearly defined, iris dark brown, bill yellowish (darkening from tip), legs brown. Voice. Song, often given for extended periods from shady trees during hottest hours of day, a long and rambling series of elements, quiet and musical; in captivity both sexes sang, female much less frequently than male. Warning "chirr" call and repeated "whit-chor-chi-vii" in agitation; distinct alarm calls for aerial and terrestrial predators, recognized by vervet monkeys (*Cercopithecus aethiops*) in Amboseli National Park (Kenya); "skrrrri" flight call.
Habitat. Open woodland, including very arid country; also lakeshore woodlands, cultivated areas and gardens, and around human habitation. Found at up to 3000 m; generally avoids humid lowland areas, but present on N Kenyan coast.
Food and Feeding. Diet chiefly insects, such as beetles (Coleoptera), ants (Formicidae), flies (Diptera), termites (Isoptera), grasshoppers (Orthoptera), mantids (Mantodea), caterpillars (Lepidoptera); also berries and small fruits *Carissa edulis*, *Rhus*, *Ficus*, *Apodytes dimidiata*, and nectar from *Agave sisalana*. In Tsavo, in S Kenya, 87% of 597 food items were insects, all taken from ground; 10% of food was fruit, 3% acacia (*Acacia*) flowers. Most food items collected on ground, where it both runs and hops; a bold scavenger around settlements and picnic sites. In small flocks of up to a dozen or so individuals. In Somalia often associated with *L. chalybaeus* and White-headed Buffalo Weavers (*Dinemellia dinemelli*), less often also with *L. shelleyi*; forages with *L. albicapillus* and Stresemann's Bushcrows (*Zavattariornis stresemanni*) in Ethiopia; associates with *L. hildebrandti* in Kenya and with Rufous-tailed Weavers (*Histurgops ruficauda*) and Red-billed Buffalo Weavers (*Bubalornis niger*) in Tanzania. Roosts in nests of *Histurgops ruficauda* and of White-browed Sparrow-weaver (*Plocepasser mahali*). Anting observed in Kenya.
Breeding. Oct–Feb in Ethiopia and Mar–Jun in Somalia; recorded in all months, with peaks Mar–Apr and Nov–Dec; in E Africa, on Laikipia Plateau, Kenya, May–Jul; timing by individual pairs evidently influenced by pre-breeding environmental conditions. Primarily monogamous, but female also solicits extra-pair copulations (apparently more likely to mate with other males within group when fewer helpers available), at times also seeks copulations with non-members of home group (of 247 offspring sampled, 14% were from extra-pair matings; in 25% of 100 nests, at least one young was fathered by a male other than social mate of breeding female). Co-operative breeder, most breeding pairs having helpers, majority of which are male offspring from previous broods; helpers contribute nesting material and feed young, but do not feed female on nest. Nest a large domed structure with side entrance, made from twigs, lined with grass and sometimes feathers, placed 1·5–6 m above ground, and well protected by thorns, in thorn tree; occasionally uses tree hole (14% of nests on Laikipia Plateau), or even hole in cliff, thatch of hut, or base of old vulture (Accipitridae) nest, and sometimes utilizes sparrow (*Passer*) nest under house eaves; often takes over nest of *Dinemellia dinemelli*, sometimes ejecting latter's eggs (weavers will on occasion eject present species' eggs), and will also use nest of *Bubalornis niger* or *Histurgops ruficauda*. Clutch 4 eggs, dark blue; incubation by female alone, period 12–14 days; chicks fed by both parents and by helpers, nestling period 17–25 days; young fed by parents and helpers for 4–7 weeks after leaving nest. Brood parasitism by Great Spotted Cuckoo (*Clamator glandarius*) recorded in Kenya. Breeding success low: over four-year period in Kenya 75% of nests failed, 90% of losses due to predation; in another study, of 64 nests, 22 failed during incubation and 25 during nestling period, and remaining 17 nests produced total of 40 fledglings, of which twelve survived to 6 months.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Widespread and abundant within its range. Common in many national parks and other protected areas.
Bibliography. Archer & Godman (1961), Bartmann (1974), Benson (1946b), Bowen (1931a), Brown, L.H. & Newman (1974), Brown, P. (1972), Carswell *et al.* (2005), Clancey (1987b), Ezra (1924), Fry *et al.* (2000), Hauser (1988), Irvine & Irvine (1974), Irwin (1957), Lack (1985), Lawrence (1975), Lewis & Ogola (1989), McCarthy (2006), Nikolaus (1987), Restall (1968a), Rilling (1972), Rubenstein (2007a, 2007b, 2007c), Short & Horne (2005), van Someren (1956), Trevor & Lack (1976).

90. **Chestnut-bellied Starling**

Lamprotornis pulcher

French: Choucador à ventre roux **German**: Rotbauch-Glanzstar **Spanish**: Estornino Ventrirrufo

Taxonomy. *Turdus pulcher* Statius Müller, 1776, Senegal.
Previously sometimes placed in genus *Spreo*. Has been thought to form a superspecies with *L. hildebrandti* and *L. shelleyi*, but exhibits several morphological differences from those two. Proposed race *rufiventris* (described from N Ethiopia) considered indistinguishable from individuals in rest of species' range. Monotypic.
Distribution. Throughout Sahel region, from S Mauritania, Senegal and Gambia, S Mali and Burkina Faso E to C Sudan, Eritrea and NW Ethiopia.



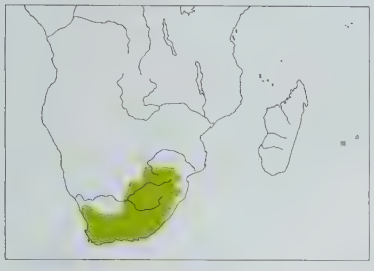
Descriptive notes. 20 cm; 59–76 g. Small, short-tailed, rather dull starling with rufous below. Crown and ear-coverts are charcoal-grey with faint gloss, lores darker, nape and upperparts glossy bronze-green; upperwing glossy bronze-green, basal two-thirds of primaries dull white (producing pale wing patch in flight), primaries P7–P9 emarginated on inner web, P6–P8 attenuated on outer web; tail glossy bronze-green; chin, throat and breast glossy bronze-green, belly, flanks, thighs and undertail-coverts chestnut-brown; iris yellowish-white; bill and legs black. Sexes alike. Juvenile is duller than adult, gloss restricted to wings and tail, underparts chestnut-brown, iris brown, bill yellowish (darkening from tip), legs brown. Voice. Song consists of soft, liquid notes. Call in flocks "whirri whirri"; alarm and mobbing call "churr-churr".
Habitat. Dry thornbush savanna and steppe, also cultivated areas and villages; occurs in dry scrubby areas during dry-season dispersal.
Food and Feeding. Diet mainly insects, including ants (Formicidae), bugs (Hemiptera), flies (Diptera), beetles (Coleoptera), termites (Isoptera) and grasshoppers (Orthoptera); also fruits of *Salvadora*, *Loranthus*, *Lantana* and *Azadirachta*; dead mouse (Muridae), small chameleon (Chamaeleonidae) and kitchen scraps also recorded. Of 79 individuals examined in Nigeria, more than 90% had eaten ants and termites; insects the main food item of 72% of these birds, with fruit in 19% of stomachs and seeds in 9%. Nestlings fed chiefly with termites and grasshoppers; 88% of 648 items brought to nests in Nigeria were insects. Forages primarily on ground. Generally in small flocks; associates with other starlings, and with White-billed Buffalo Weavers (*Bubalornis albirostris*).
Breeding. Season extended, and often two distinct periods; recorded in all months in Senegal, Apr–Jul in Gambia, Apr–Nov in Mali, Jun–Aug in Burkina Faso and Niger, Feb–Jun and Sept–Nov in Nigeria, May–Jul and Oct–Nov in Chad, Jan–Jun and Sept–Nov in Sudan, and Feb–May in Ethiopia. Monogamous. Highly developed co-operative breeding; groups composed of two or more breeding pairs, with 6–26 non-breeding individuals. Nest, built by both members of breeding pair, a free-standing ball of grass with side entrance, lined with feathers and once a snakeskin, placed up to 12 m (generally 2–3 m) above ground in thorny tree such as desert date (*Balanites aegyptiaca*); in Ethiopia and Eritrea nests of *Bubalornis albirostris* used; in Chad breeds in association with *L. chalybaeus*; captives brought grass and leaves into nestbox, but no eggs laid. Clutch 3–5 eggs, blue, with a ring of brown markings and mauve spots near thick end; incubation by breeding female alone, period 13–18 days; chicks fed by breeding pair and by up to 13 helpers (the more helpers, the more successful the nest), nestling period 18–25 days; young fed by helpers for several weeks after leaving nest. Nests occasionally parasitised by Levaillant's Cuckoo (*Clamator levaillantii*) in Mali and Gambia. Fewer than 50% of fledglings survived beyond 3 months. Annual adult survival rate 80% for males, 90% for breeding females.
Movements. Presumed resident; local movements likely in arid habitat with unpredictable conditions. Ranges widely in non-breeding season. Vagrants recorded in Guinea-Bissau, Guinea and N Ivory Coast.
Status and Conservation. Not globally threatened. Locally common to uncommon; abundant in some areas, e.g. Sudan. Rare in N Ghana and N Togo. Wide range in thinly populated regions.
Bibliography. Bates (1934a), Borrow & Demey (2001), Cheesman & Sclater (1936), Fry *et al.* (1988, 2000), Nikolaus (1987), Schifter (1986), Serle (1943b), Smith (1957), Wilkinson (1978a, 1982a, 1982b, 1983), Wilkinson & Brown (1984).

91. **African Pied Starling**

Lamprotornis bicolor

French: Spréo bicolore **German**: Zweifarb-Glanzstar **Spanish**: Estornino Bicolor
Other common names: Pied Starling

Taxonomy. *Turdus bicolor* J. F. Gmelin, 1789, Cape of Good Hope, South Africa.
Until recently was usually placed in genus *Spreo*. Monotypic.
Distribution. South Africa (except NW, N & E), Lesotho and W Swaziland.
Descriptive notes. 25 cm; 93–113 g. Medium-sized dark starling with pale eye. Crown, nape and upperparts are blackish-brown with some greenish sheen; wing and tail blackish with oily green



gloss; chin, throat, breast and thighs blackish-brown with some sheen, belly and undertail-coverts white; iris white; upper mandible black, lower mandible yellow with black tip, yellow wattle at corner of bill; legs black. Sexes alike. Juvenile has matt black plumage, lacking gloss, iris brown, base of lower mandible yellowish-white, wattle at gape white; iris colour changes over two years, extent of yellow on lower mandible also increases. Voice. Song a rambling combination of musical warbling and harsh notes; male may sing for several minutes while perched near nest. Flight call and flight-intention call a characteristic loud "wreek-wreek"; harsh squawk in alarm.

Habitat. Open areas dominated by grassland, and long associated with agricultural regions and open ground around farm homesteads, occurring also on fields near domestic stock. Occurs in villages and small towns in rural areas (absent from larger urban areas). To 2500 m in mountains, and down to sea-level in W of range.

Food and Feeding. Omnivorous. Animal food includes carrion, such as toads (Amphibia) squashed on roads; also small lizards, ticks (Acarina), solifugids (Solifugida), centipedes (Chilopoda), amphipods (Amphipoda); and many insects, such as termites (Isoptera), ants (Formicidae), beetles (Coleoptera), grasshoppers (Orthoptera), dragonflies (Odonata), butterflies and caterpillars (Lepidoptera). Fruits taken include those of *Ficus*, *Lycium*, *Scutia myrtina*; succulent leaves of *Lycium*, arils of *Acacia cyclops*, nectar from *Agave*, *Aloe arborescens*, *Aloe ferox*, *Erythrina caffra*, *Sideroxylon inerme*. Stomach contents included seeds and other plant material from *Atriplex semibaccata*, *Convolvulus*, *Cotoneaster horizontalis*, *Cussonia paniculata*, *Cyperus esculentus*, *Euclea crispa*, *Ligustrum lucidum*, *Medicago sativa*, *Nicandra physaloides*, *Opuntia*, *Portulaca*, *Protasparagus laricinus*, *Sophora japonica*, *Zea mays*. Forages in trees and bushes, but primarily on ground, where it walks and runs; may turn over dry cowpats in search of insects. Often feeds alongside *Sturnus vulgaris* and *Creatophora cinerea*. Forages also in rocky intertidal zone, and visits gardens and orchards; collects kitchen scraps at houses. In small groups; regularly in association with domestic stock, catching insects disturbed by the mammals, and perching on sheep and cattle, from which it removes ectoparasites. Large communal roosts in reedbeds or trees may hold in excess of 1000 individuals; roost-sites shared with Lesser Kestrels (*Falco naumanni*), which responded to starlings' alarm calls; often flocks and roosts with *Creatophora cinerea*.

Breeding. Aug–Nov in SW (winter-rainfall region); elsewhere Sept–Jan and with second minor peak in Apr–May; some breeding records in all months, and commonly double-brooded. Monogamous; regularly co-operative breeder, with up to five helpers, primarily subadult and unpaired individuals. Allofeeding regular, primarily between members of same breeding unit. Nest consists of pads of grass, roots, wool, muddy bits of sedge, even paper and pieces of rope, occasionally snakeskin, usually in tunnel up to 1·8 m deep excavated by the birds themselves in riverbank, gulley or similar site; in parts of Western Cape exclusively in tunnel excavated by European Bee-eaters (*Merops apiaster*), and in one instance displaced incubating bee-eaters and removed their eggs; also utilizes hole in building, hollow in bale of hay or, rarely, natural tree hole, and once found nesting on a wrecked ship c. 200 m from beach. Clutch 2–6 eggs, usually 4, eggs blue-green, plain or sparsely spotted with red; incubation by female only, period 14–16 days; chicks fed by both parents and by helpers, in captivity only by breeding pair (but allofeeding between group-members observed), nestling period 23–27 days. Brood parasitism by Great Spotted Cuckoo (*Clamator glandarius*) frequent, and parasitism by Greater Honeyguide (*Indicator indicator*) recorded in several areas. Successful defence of nest against predators, including Nile monitor (*Varanus niloticus*), mole snake (*Pseudaspis cana*), Cape cobra (*Naja nivea*) and yellow mongoose (*Cynictis penicillata*); European Bee-eaters benefit from nesting in association with present species through protection from predation, despite competition for nesting burrows.

Movements. Mainly sedentary; large nomadic flocks in some regions.

Status and Conservation. Not globally threatened. Common to abundant; uncommon and more local at extremities of range; rare in arid NW and largely absent from E coastal lowlands. Generally widespread, and utilizes man-modified habitats.

Bibliography. Brooke (1995), Craig (1983a, 1983b, 1983c, 1985, 1987, 1988a, 1997d), Dean & Macdonald (1981), Every (1975), Fry *et al.* (2000), Godfrey (1922), Herholdt (1987), Hockey *et al.* (2005), Jacot Guillarmod *et al.* (1979), Jensen & Jensen (1969), Joubert (1945), Jubb (1980b, 1983), Kok & van Ee (1990), McCarthy (2006), van Niekerk (1996), Oatley & Skead (1972), Roberts (1939), Robinson *et al.* (1957), Rudebeck (1955), Skead, C.J. (1995), Skead, D.M. (1966), Sweijd & Craig (1991), Török (1999), Wilkinson *et al.* (1993).

92. White-crowned Starling

Lamprotornis albicapillus

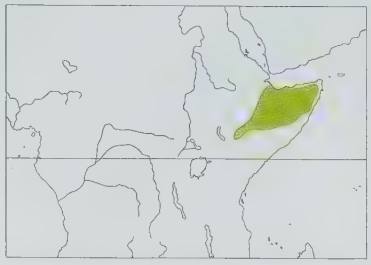
French: Spréo à calotte blanche **Spanish**: Estornino Coroniblanco
German: Weißscheitel-Glanzstar

Taxonomy. *Spreo albicapillus* Blyth, 1855, Somalia.

Until recently was usually placed in genus *Spreo*. Smaller birds from N Kenya and adjacent S Ethiopia described as race *horrensis*; possibly merits recognition, but further study required. Treated as monotypic.

Distribution. S Ethiopia, N Kenya and N & W Somalia.

Descriptive notes. 23–27 cm. Large, pale-eyed starling with distinctive plumage pattern. Has crown white, lores and ear-coverts dull grey, nape and upperparts bronzy green with some gloss; wing glossy bronze-green, outer margins of outer four secondaries and their coverts white (forming white band on folded wing), primaries P6–P9 have indentation on inner web, and P5–P8 attenuated outer web; tail glossy bronze-green; chin, throat, breast and flanks dull grey with some gloss, and white feather shafts producing streaky effect; belly, thighs and undertail-coverts are white; iris yellowish-white; bill and legs black. Sexes alike. Juvenile has grey-white crown, no gloss except on remiges and rectrices, white streaks below are indistinct, iris brown, bill yellow (darkening from tip), legs brown. Voice. Song of upslurred sounds of varied lengths, transcribed as "krrrri-kuri-kuri-koyi". Shrill, rising call and harsh alarm call.



Habitat. Park-like thornveld and acacia (*Acacia*) woodland, also open cattle pastures, and near settlements and cultivated areas; to 1500 m.

Food and Feeding. Diet includes insects, fruit and seeds. Flocks gather at fruiting *Salvadora* trees, and feed on cultivated dates (*Phoenix*) in Somalia; accompanies camels, apparently catching flushed insects. Forages in groups at all times, primarily on ground; often associated with White-headed Buffalo Weaver (*Dinemellia dinemelli*) in Somalia, and with Stresemann's Bushcrow (*Zavattariornis stresemanni*) in Ethiopia.

Breeding. Breeds Mar–May in Ethiopia, Mar–Apr in Kenya and Apr–Jun in Somalia. Co-operative breeding suspected, but unconfirmed. Loosely colonial; several nests may be placed in one bush, and usually in scattered colonies. Nest a ball-shaped mass of grass with protruding side entrance, placed c. 1·5 m above ground in thorn bush; in captivity, built a deep, dome-like nest of dry leaves, sticks and moss in a basket. Clutch 4–6 eggs, greenish-blue with purple-red spotting; in captivity, incubation by female alone, period c. 13 days, chicks fed by both parents, nestling period 25 days. Brood parasitism by Great Spotted Cuckoo (*Clamator glandarius*) in Somalia.

Movements. Presumed resident.

Status and Conservation. Not globally threatened. Locally common. Utilizes man-modified habitats. May cause some damage to commercial fruit crops, e.g. cultivated dates in Somalia.

Bibliography. Archer & Godman (1961), Ash & Miskell (1983), Benson (1946b), Boetticher (1936), Clarke (1985), Dellelegn (1993), Ezra (1929), Fry *et al.* (1988, 2000), McCarthy (2006), Petzsch (1951), Turner & Forbes-Watson (1976), Zimmerman *et al.* (1996).

93. Fischer's Starling

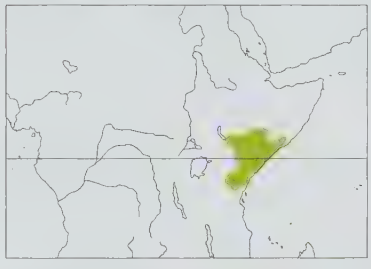
Lamprotornis fischeri

French: Spréo de Fischer **German**: Fischerglanzstar **Spanish**: Estornino de Fischer

Taxonomy. *Notauges Fischeri* Reichenow, 1884, plains near Pare Mountains, Moshi District, south of Kilimanjaro, Tanzania.

Until recently was usually placed in genus *Spreo*; has also been placed with *L. unicolor* and *L. regius* in a separate genus, *Cosmopsarus*. Monotypic.

Distribution. SE Ethiopia, S Somalia, E Kenya and NE Tanzania.



Descriptive notes. 18 cm; 51 g. Small starling with white eyes and white on underparts. Cap or whole head paler ash-grey than rest of upperparts and breast, sometimes whitish; rest of upperparts dull ash-grey with some bronze sheen on back and rump; upperwing-coverts grey, flight-feathers and tail dull bronzy green; lores and moustachial stripe black; chin, throat and breast ash-grey, belly, flanks, thighs and undertail-coverts white; iris creamy white; bill and legs black. Sexes alike. Juvenile has upperparts brownish with pale feather edges, iris brown, bill yellowish. Voice. Song a squeaky, metallic phrase, reminiscent of song of Dark-backed Weaver (*Ploceus bicolor*). Call in flock a shrill whistle, also repeated wheezy "cree-wee-creewoo" call.

Habitat. Dry, open thornveld and wooded savanna, to 1900 m.

Food and Feeding. Diet mainly insects, including termites (Isoptera), grasshoppers (Orthoptera), beetles (Coleoptera), and both adult and larval butterflies (Lepidoptera); also berries. In Kenya, insects constituted 99% of 292 food items, all collected from ground. Forages primarily on ground. In pairs and small flocks; may flock with *Creatophora cinerea* or associate loosely with *L. regius*.

Breeding. Apr–May in Ethiopia, Mar–Jun in Somalia, Apr–May and Sept–Nov in Kenya, and Dec in Tanzania. Monogamous; co-operative breeder, up to four adults attending single nest, some individuals fed chicks at more than one nest. Nest a dome of coarse grass with side entrance above small ramp, lined with feathers, placed c. 2·5 m above ground in thorn tree. Clutch 4 eggs, blue with red spots; chicks fed by several adults; no informatin on duration of incubation and nestling periods.

Movements. Presumed resident; seasonal peak in numbers in S Kenya (Tsavo) suggests local movements.

Status and Conservation. Not globally threatened. Locally common. Restricted to a thinly populated region unsuitable for agriculture.

Bibliography. Erlanger (1905), Fry *et al.* (2000), Fuggles-Couchman & Elliott (1946), Lack (1985), Miskell (1977), Njoroge *et al.* (2008), Zimmerman *et al.* (1996).



PLATE 46

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cm 10

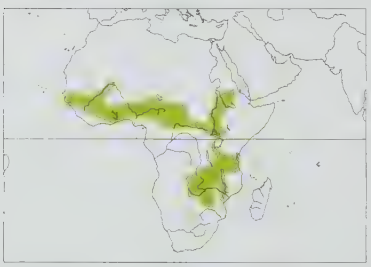
94. **Lesser Blue-eared Starling**

Lamprotornis chloropterus

French: Choucador de Swainson **German**: Messingglanzstar **Spanish**: Estornino de Swainson **Other common names**: Lesser Blue-eared Glossy Starling, Swainson's Green-tailed Glossy Starling; Miombo Blue-eared/Southern Lesser Blue-eared (Glossy) Starling (*elisabeth*)

Taxonomy. *Lamprotornis chloropterus* Swainson, 1838, Western Africa.
May form a superspecies with *L. acuticaudus*. Races sometimes treated as two distinct species, forming a superspecies. Proposed race *cyanogenys* (described from Sennar, in Sudan) is regarded as a synonym of nominate. Two subspecies recognized.

Subspecies and Distribution.
L. c. chloropterus Swainson, 1838 – Senegal, Gambia, Guinea-Bissau, Guinea, N Sierra Leone, Mali and Ivory Coast E to S Chad, Central African Republic, S Sudan, W Ethiopia, Eritrea, N Uganda and NW Kenya.
L. c. elisabeth (Stresemann, 1924) – SW Uganda, SE Kenya, Tanzania, SE DRCongo, Zambia and Malawi S to extreme NE Namibia (E Caprivi), W Mozambique and Zimbabwe.



Descriptive notes. 18 cm; 63–86 g. Small glossy starling with relatively short tail. Nominate race has forehead, crown, nape and upperparts glossy blue-green, some dark spots near tips of uppertail-coverts; lores and ear-coverts appear black, ear-coverts with blue gloss, forming distinctive patch; wing blue-green, blue gloss on primary coverts, dark velvety spots at tips of median and greater coverts and tertials, bronzy-purple epaulet on bend of wing; tail glossy blue-green; chin, throat, breast, most of belly and undertail-coverts glossy blue-green, flanks, thighs and centre of belly violet-blue; iris orange-yellow; bill and legs black. Sexes alike. Juvenile has greenish sheen above, lacks dark spots on wing-coverts, both epaulet and ear patch are dull and indistinct, has grey-tinged fawn-brown throat and underparts, iris brown to greyish. Race *elisabeth* adult is very like nominate but somewhat less bright green, juvenile is distinctively rufous-brown below. VOICE. Song a simple phrase of 6–12 notes, rendered as e.g. "chip chirrew kwip kreeup kwip krip cheeu". Alarm call a harsh "chair"; flight call clear "wirri-gwirri".

Habitat. Woodland of various types. Mainly in savanna woodland, farmland and bushland in W & N parts of range; S race (*elisabeth*) primarily in miombo (*Brachystegia*) woodland when breeding, later more scattered, entering towns and gardens. Lowlands in most of range, including Ethiopia; in Kenya, above 1000 m in NW (nominate), coastal in SE (*elisabeth*); in S mainly above 800 m, in Malawi generally up to 1700 m.

Food and Feeding. Diet fruit, nectar and insects. Fruit of *Sterculia quinqueloba*, *Ficus natalensis*, and exotics *Azadirachta* and *Michelia champaca*. Nectar of *Bombax* taken. Insects include beetles (Coleoptera), termites (Isoptera), caterpillars (Lepidoptera), and locusts and other grasshoppers (Orthoptera). Forages both in trees and on ground. In pairs when breeding; at other times in small groups and larger flocks, often with *L. chalybaeus* and *L. purpureus*, sometimes with *Cinnyricinclus leucogaster* in W Africa; in Uganda associates with *L. chalcurus*, and in Zambia with *L. acuticaudus*. Roosts of 500–1200 individuals in non-breeding season, and roosting flocks of more than 10,000 reported from Zambia, in reedbeds or trees, sometimes associated with *L. chalybaeus* and *Creatophora cinerea*.

Breeding. Season Feb–Apr in Nigeria (probably also in Ghana); in DRCongo, Mar in N (Uele region) but Sept–Oct in SE (Shaba region); Jun–Jul in Eritrea, and May–Jun in Ethiopia and Kenya; in S (race *elisabeth*) breeds mainly Sept–Oct, with records to Dec in Malawi and possibly to Mar in Zimbabwe. Presumably monogamous; one report suggestive of co-operative breeding. Nest a pile of dry grass and leaves, placed in hole in tree, one nest sited in space between tree trunk and dead bark. Clutch 2–5 eggs, pale blue-green, sparingly spotted with grey and rusty red; young fed by both parents; no information on duration of incubation and nestling periods.

Movements. Presumed resident in most areas, with only very local movements. In Nigeria seasonal shifts linked to rainfall, and in Sudan reported as only a Jul–Oct visitor to Khartoum region; in Zambia, appeared to be a dry-season visitor to most N areas.

Status and Conservation. Not globally threatened. Locally common in many areas within its wide range; true status difficult to assess, as often confused with similar species. Population in C Mozambique estimated at more than 10,000 individuals. Race *elisabeth* occasionally recorded (has bred) in extreme NE South Africa.

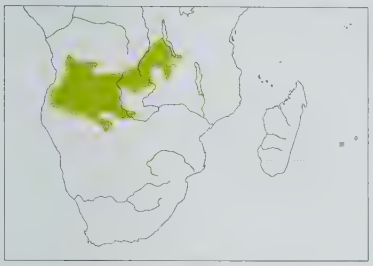
Bibliography. Aspinwall (1978), Belcher (1930), Borrow & Demey (2001), Brooke (1965b), Carswell *et al.* (2005), Cheesman & Sclater (1936), Craig (2000), Dowsett *et al.* (2008), Fry *et al.* (2000), Fuggles-Couchman (1984), Hockey *et al.* (2005), Irwin (1953), Nikolaus (1987), Parker (2005), Serle (1957), Tree (1997).

95. **Sharp-tailed Starling**

Lamprotornis acuticaudus

French: Choucador à queue fine **German**: Keilschwanz-Glanzstar **Spanish**: Estornino Colifino
Other common names: Sharp-tailed Glossy Starling

Taxonomy. *Lamprocolius acuticaudus* Bocage, 1869, Huila, Angola.
May form a superspecies with *L. chloropterus*. Two subspecies recognized.
Subspecies and Distribution.
L. a. acuticaudus (Bocage, 1869) – C Angola (S to SC Huíla), S DRCongo, W & N Zambia and SW Tanzania.
L. a. ecki Clancey, 1980 – S Angola, NE Namibia and extreme NW Botswana.



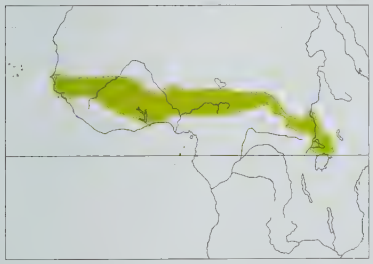
Descriptive notes. 20 cm; 61–76 g. Medium-sized starling with a fairly short, graduated tail. Nominate race has crown, nape and upperparts glossy green; wing glossy green, with bronze-tinged purple patch at bend of wing, dark blue terminal spots on wing-coverts and tertials, primaries P7–P9 have slight indentation on inner web; tail glossy green with faint cross-barring; chin, throat, breast and undertail-coverts glossy green, some blue gloss on belly and flanks; iris red; bill and legs black. Sexes alike in plumage, female possibly with iris orange, rather than red. Juvenile is matt grey with paler feather tips, appearing scaly, some gloss on wings and tail, iris yellow. Race *ecki* is similar to nominate, but has gloss above more greenish-blue, sides of breast and flanks deeper glossy blue, juvenile feather tips whiter (less buffy). Voice. Song is a series of high-pitched warbling and upslurred notes with chuckles and churrs. Contact call is a liquid "puree-o-wit"; twittering calls are made in flocks.
Habitat. Inhabits open woodland, particularly dry miombo (*Brachystegia*) and mopane (*Colophospermum*) country, at altitude range of 900–1700 m.
Food and Feeding. Diet fruit and probably insects; fruit of *Diospyros kirkii* and *Diospyros lycioides* recorded. In pairs and small flocks. Noted as foraging alongside bulbuls (Pycnonotidae) and other starlings in fruiting trees; non-breeding flocks of more than 40 individuals, sometimes with *L. chalybaeus* and *L. chloropterus*.
Breeding. Breeds apparently Aug–Oct in Angola; Oct in Zambia and Nov–Mar in Namibia. Nest a pad of grass, hair and feathers in tree hole. One nest held three young, fed by both adults. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Common in parts of its fairly extensive range. Rare in Botswana, from where very few records.
Bibliography. Boetticher (1931b), Bowen (1931b), Brooke (1968a), Chapin (1954), Clancey (1980b), Craig (2000), Dean (1974a, 2000b), Dean *et al.* (1987), Dowsett *et al.* (2008), Fry *et al.* (2000), Heinrich (1958), Hockey *et al.* (2005), Penry (1986), Underhill & Brown (1997).

96. **Purple Glossy Starling**

Lamprotornis purpureus

French: Choucador pourpré **German**: Purpurglanzstar **Spanish**: Estornino Purpúreo

Taxonomy. *Turdus purpureus* Statius Müller, 1776, Juida = Benin.
Populations from Cameroon E to W Kenya often separated as race *amethystinus* (described from S Sudan), supposedly somewhat bluer above and slightly longer-tailed than those in W of range; further study required. Treated as monotypic.
Distribution. Senegambia, Guinea-Bissau, S Mali and N Guinea E (mainly in savanna belt) to S Chad, N Central African Republic, S Sudan, Uganda and W Kenya.



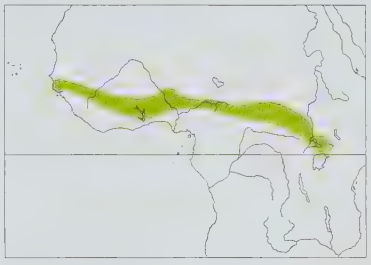
Descriptive notes. 27 cm; 91–140 g. Large glossy starling with short tail and relatively large bill; eye often appears large. Has forehead and crown purple, lores black, nape and hindcrown-band to back of eye blue with some purple gloss; mantle and back blue-green, rump purple; wing blue-green, dark spots on tips of coverts, and blue-and-violet patch forming epaulet; tail purple, two outermost rectrices have blue outer webs; chin, throat and entire underparts to undertail-coverts purple; iris yolk-yellow; bill and legs black. Sexes alike. Juvenile is matt grey, except for gloss on wings and tail (in captivity, first glossy plumage appeared at three months); iris grey, later greenish-yellow. Voice. Song, noted from flocks in trees during heat of day, a sustained chatter. Flight call "twee-twee"; contact call "squee caree"; alarm call "shree".
Habitat. Open savanna woodland N of forested zone, open areas with scattered bushes and trees, also in burnt and cultivated areas; up to 1500 m.
Food and Feeding. Diet fruit, nectar and insects. Fruits of *Ficus* and *Zizyphus*, and of exotic neem (*Azadirachta indica*); nectar of *Bombax costatum* and *Ceiba pentandra*; termites (Isoptera), caterpillars (Lepidoptera) and ants (Formicidae) noted in stomach contents. Forages both in trees and bushes and on ground, often in company with other glossy starlings; hawks insects from trees. Communal roosts in non-breeding season may contain thousands of individuals.
Breeding. Season Apr–Jul in Gambia, Ghana and Nigeria, Mar–May in Sudan, and Feb–Apr in Uganda. Nest in tree hole, sometimes under house eaves or in drainpipe (in Ghana); in captivity, lining of dry grass and leaves in nestbox, and green leaf fragments added even after young hatched. Clutch 2–3 eggs, pale blue, finely speckled with reddish-brown; in captivity, incubation by female only, nestlings fed by both adults; incubation by female only, period 13 days from laying of last egg; nestling period 25 days, nestlings fed by both adults, who squashed insect food before passing it to chicks, and fed young for at least one week after fledging. Captive female mated with male *L. chalybaeus*; two young hatched, but not raised successfully.
Movements. Presumed resident, as present throughout year in most areas; local movements likely, as in e.g. Ivory Coast, where birds move S during dry season. Vagrant in S Mauritania and Liberia.
Status and Conservation. Not globally threatened. Locally common to abundant; perhaps the most abundant glossy starling in parts of W Africa; uncommon in extreme E of range (W Kenya). During early years of 20th century, was one of the species collected on a large scale for the bird-plumage trade in Europe.
Bibliography. Bannerman (1948), Barlow *et al.* (1997), Borrow & Demey (2001), Carswell *et al.* (2005), Fry *et al.* (2000), Grimes (1987), Nikolaus (1987), Pettet (1977), Smith & Schofield (2005), Thomson (1969), Thonnerieux *et al.* (1989), Yusufu & Bello (2004).

97. **Bronze-tailed Glossy Starling**

Lamprotornis chalcurus

French: Choucador à queue violette **German**: Erzglanzstar **Spanish**: Estornino Colibronceado

Taxonomy. *Lamprotornis chalcura* Nordmann, 1835, Senegal.
Populations from N Cameroon E to W Kenya often separated as race *emini* (described from Uganda), supposedly somewhat more violet on rump and slightly longer-tailed than those in W of range; variation, however, appears to be clinal, and further study required. Treated as monotypic.
Distribution. Senegambia, N Guinea-Bissau, S Mali, N Guinea, N Ivory Coast and S Burkina Faso E (mainly in savanna belt) to S Chad, Central African Republic, SW Sudan, Uganda and W Kenya.



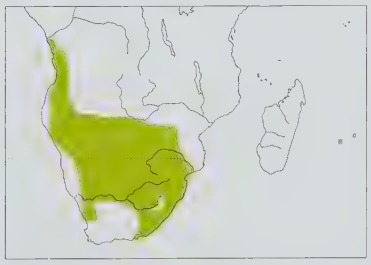
Descriptive notes. 21 cm; 63 g. Fairly large, green-looking starling with short tail. Forehead, crown, nape and mantle are iridescent blue-green, lores black, back and rump blue with purple tinge; ear-coverts purple; wing blue-green, coverts and tertial with dark blue tips, bend of wing with blue-and-purple epaulet, inner webs of primaries P6–P9 with indentation; tail purple with bronzy gloss and faint barring, outermost rectrices blue; chin, throat, breast, thighs and undertail-coverts blue-green, belly purple; iris yellow; bill and legs black. Sexes alike. Juvenile is blackish with slight blue tinge above, dull sooty black below, rectrices greenish, iris dark. Voice. Song a combination of nasal, chattering and whistled elements, often in chorus. Contact call "ju-wee-yurr". Loud wing noise in flight.
Habitat. Open bushed and wooded country, also cultivated areas around villages and suburbs, mainly in lowlands; in E of range 500–2000 m, in Kenya above 1000 m and in regions of high rainfall.
Food and Feeding. Stomach contents of specimens contained insects and fruits; second-hand report of scavenging from meat at abattoirs. Forages mostly on ground, less so in trees. In pairs when breeding; at other times in flocks, sometimes quite large ones, and associates with both *L. chalybaeus* and *L. chloropterus*.
Breeding. Breeding reported in Aug in Senegal, May–Jun in Nigeria, Feb–Mar in NE DRCongo and Apr in Kenya. Nest a lining of grass, leaves and feathers in tree hole or stump. Clutch up to 4 eggs, plain pale blue, or finely speckled with orange-brown; incubation apparently by female. No other information.
Movements. Mainly resident. Status in some places unclear; described as a migrant in Sudan, present Sept–Apr; also evidence of seasonal movements in Ghana, and transient flocks in Gambia Oct–Nov.
Status and Conservation. Not globally threatened. Poorly documented, as often not separable in the field from similar congeners (especially *L. chloropterus*). Appears to be locally common to uncommon in much of range; generally uncommon in E (NE DRCongo, Uganda, W Kenya).
Bibliography. Borrow & Demey (2001), Carswell *et al.* (2005), Chapin (1954), Davey (1982), Fry *et al.* (2000), Lewis & Pomeroy (1989), Lowe (1937), Nikolaus (1987), Serle (1943b), Zimmerman *et al.* (1996).

98. **Cape Glossy Starling**

Lamprotornis nitens

French: Choucador à épaulettes rouges **Spanish**: Estornino de El Cabo
German: Rotschulter-Glanzstar
Other common names: Red-shouldered Glossy Starling

Taxonomy. *Turdus nitens* Linnaeus, 1766, Angola.
Birds from Namibia E to Zimbabwe and NE South Africa often separated as race *phoenicopterus* and those from E South Africa as *culminator* on basis of size and colour (larger and greener); geographical variation, however, appears clinal, with intergradation between adjoining populations throughout species' range. Treated as monotypic.



Distribution. From around mouth of R Congo S through W & S Angola to SW Zambia and Zimbabwe, S to Namibia, Botswana, South Africa (except S & SW Cape region and dry W interior), W lowlands of Lesotho, Swaziland and S Mozambique.
Descriptive notes. 25 cm; 75–105 g. Fairly large, short-tailed glossy starling with rather uniform appearance. Head is glossy blue, blacker on ear-coverts; upperparts blue-green with strong iridescence; wing blue-green, dark blue spots at tips of some median and greater coverts, distinct bronzy-purple epaulet, primaries P6–P9 strongly indented on inner webs; tail glossy blue-green; throat and upper breast have blue iridescence, lower breast, belly and undertail-coverts with greener gloss; iris bright orange-yellow; bill and legs black. Sexes alike. Juvenile is

On following page: 99. Emerald Starling (*Lamprotornis iris*); 100. Greater Blue-eared Starling (*Lamprotornis chalybaeus*);

dull-plumaged, with matt black underparts, iris initially grey; at three months iris dull yellow, acquiring adult colour after six months. Voice. Song a sustained warbling with varied notes, and may include imitation of other bird species; sings throughout year, in chorus at roost-sites in morning and evening, also often at midday when perched in shady tree; male sings near nest-site while female incubating. Alarm call a harsh "kaarr"; flight call a rolling "turrrreeu". Loud swishing wing noise in flight.
Habitat. Savanna woodland and riverine vegetation; in arid areas restricted to taller trees along watercourses. Also forest edge, plantations, parks and gardens. From sea-level to 1800 m.
Food and Feeding. Omnivorous; diet chiefly fruit and insects, but also other animal food including mammalian carrion, ticks (Acarina) and millipedes (Diplopoda); takes bread and bone meal at birdtables. Fruit such as *Ficus*, *Lycium*, *Rhus*, *Olea*, *Scutia myrtina*, *Azima tetracantha*, *Diospyros pubescens*, *Atriplex bacifera*; nectar of *Erythrina caffra*, *Boscia albitrunca*, *Protea subvestita*, *Grevillea*, and numerous species of *Aloe* also taken. Insects recorded as eaten are wasps and ants (Hymenoptera), including the ant *Plagiolepis custodiens* (filled with honeydew), grasshoppers (Orthoptera), termites (Isoptera), beetles (Coleoptera), caterpillars (Lepidoptera) and flies (Diptera). Forages both in trees and bushes and on ground. Often feeds in association with grazing ungulates such as cattle, blue wildebeest (*Connochaetes taurinus*), impala (*Aepyceros melampus*) and white rhinoceros (*Ceratotherium simum*); may perch on the animals to hawk flies, and gleans ectoparasites from cattle, sable antelope (*Hippotragus niger*) and gemsbok (*Oryx gazella*). Usually in groups of up to c. 20 individuals, sometimes in much larger flocks; occasionally joins mixed-species flocks of insectivorous birds feeding in woodland in South Africa. Roosts in small groups in trees.
Breeding. Breeds Sept–Feb/Mar in S Africa, and probably Feb–Mar in Angola. Monogamous. Co-operative breeder, most helpers probably offspring of breeding pair; some remain as helpers for up to three years. Nest built by both sexes, material including horse and cow dung, dry grass, feathers, and shed snakeskins, helpers may bring feathers to female during incubation, placed usually in tree hole, including old hole of woodpecker (Picidae) or barbet (Capitonidae), rarely hole in riverbank; man-made structure such as fence post, hollow metal post or pipe sometimes used, or nest sited under roof or even in wooden postbox in daily use; twigs and other material may be used to fill up cavity until nest closer to entrance; pairs using nestboxes in Namibia selected those more than 2 m above ground. Clutch 3 eggs, pale greenish-blue, speckled with light red; incubation by female alone, period 12–14 days; young fed by both parents, and by at least three helpers, nestling period c. 20 days. Nests parasitized by Great Spotted Cuckoo (*Clamator glandarius*) in Namibia and probably elsewhere; one record of nest containing egg of Greater Honeyguide (*Indicator indicator*).
Movements. Presumed resident; in one garden, ringed individuals remained on same territory for four years.
Status and Conservation. Not globally threatened. Widespread and common in much of range. Population in Kruger National Park, in NE South Africa, estimated at more than 32,000 individuals, in Kgalagadi Transfrontier Park (SW Botswana–South Africa border) at 16,000 or more, and in S Mozambique at more than 40,000 birds. Recorded in S PRCongo and possibly in Gabon. No breeding records from Zambia. Common in many protected areas.
Bibliography. Amadon (1956), Barry (1998), Borrow & Demey (2001), Cole (1963), Craig (1983a, 1983c, 1997f, 2000), Dean (2000b), Donnelly (1966, 1967), Dowsett *et al.* (2008), Fry *et al.* (2000), Godfrey (1922), Hockey *et al.* (2005), Hoesch & Niethammer (1940), Kannemeyer (1951), Kemp *et al.* (2001), Macdonald (1957), Newman (1971), Oatley & Skead (1972), Parker (1999), Penzhorn (1982), Plowes (1944), Riekert & Clinning (1985), Skead (1995), Taylor (1951), Thomson & Ferguson (2007), Vernon (1973).

99. Emerald Starling

Lamprotornis iris

French: Choucador iris **German**: Schillerglanzstar **Spanish**: Estornino Esmeralda
Other common names: Emerald Glossy Starling, Iris Glossy Starling

Taxonomy. *Coccycolius iris* Oustalet, 1879, Los Islands, coast of Guinea, probably error = interior Guinea.
Sometimes placed in a monotypic genus *Coccycolius*. Monotypic.
Distribution. Guinea, N Sierra Leone and C Ivory Coast.



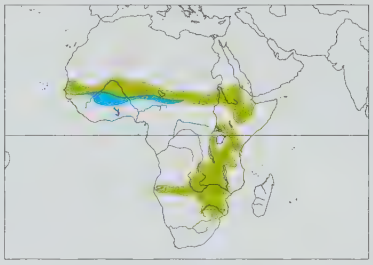
Descriptive notes. 21 cm. Small, distinctive, glossy green starling with medium-length tail. Has curved patch of purple from behind eye, extending over ear-coverts and down towards side of throat; rest of head, upperparts, including wing and tail, and chin, throat, upper breast and undertail-coverts brilliant emerald-green; belly glossed purple, thighs grey without iridescence; iris dark brown; bill and legs black. Sexes alike. Juvenile is duller than adult, with dorsal plumage glossy olive-green, underparts matt grey-brown. Voice. Wheezy and squeaky calls; captive individual gave high-pitched "pee-pee-pee" in alarm, harsher version when mobbing ground predators.
Habitat. Savanna woodland.
Food and Feeding. Diet fruit and insects. Fruit of *Ficus* and *Harungana madagascariensis*; insects such as ants (Formicidae) and caterpillars (Lepidoptera). Forages on ground, as well as in tops of trees. In small groups.
Breeding. Breeding in Mar in Sierra Leone. May be a co-operative breeder, as captive groups seen to have helpers, latter including adults and immatures of both sexes. Nest in tree hole; in captivity, used tree hole or nestbox, lining this with both dry and green material, green leaves taken from living plants. Clutch 3–4 eggs, pale blue with red-brown blotching; in captivity, incubation by female alone, period 14 days, chicks fed by both parents and in some cases by helpers, nestling period 21 days.
Movements. Presumed resident; some local movements, possibly seasonal. Vagrant recorded in SW Mali.
Status and Conservation. Data-deficient. Very poorly known. Reported as locally common within its limited range. Can be bred successfully in captivity.
Bibliography. Anon. (2008b), Bannerman (1932, 1948), Borrow & Demey (2001), Bruch (1983), Butchart & Stattersfield (2004), Feare & Craig (1998), Fry *et al.* (2000), Pyper (1994), Robiller & Gerstner (1985), Shelton (1982), Stattersfield & Capper (2000), Steinbacher (1980), Wilkinson (1996, 1997).

100. Greater Blue-eared Starling

Lamprotornis chalybaeus

French: Choucador à oreillons bleus **Spanish**: Estornino Orejiazul
German: Grünschwanz-Glanzstar
Other common names: (Greater) Blue-eared/Green Glossy Starling

Taxonomy. *Lamprotornis chalybaeus* Hemprich and Ehrenberg, 1828, Ambukol, Dongla district, Sudan. Race *nordmanni* sometimes treated as a synonym of *sycobius*. Proposed race *hartlaubi* (described from Senegal), formerly used for N populations (E to Sudan), is regarded as synonymous with nominate. Four subspecies recognized.
Subspecies and Distribution.
L. c. chalybaeus Hemprich & Ehrenberg, 1828 – S Mauritania, Senegambia, S Mali, Burkina Faso, S Niger and N Nigeria E to C Sudan; dry-season visitor to N Ivory Coast, Togo and Benin.
L. c. cyaniventris Blyth, 1855 – Eritrea, Ethiopia, NW Somalia, N Uganda, E DRCongo and N Kenya.
L. c. sycobius (Hartlaub, 1859) – SW Uganda, S Kenya, Rwanda, Burundi, Tanzania, SE DRCongo, N & E Zambia, Malawi and W Mozambique.
L. c. nordmanni (E. J. O. Hartert & Neumann, 1914) – S Angola and N Namibia E to N & E Botswana, S Zambia, Zimbabwe, NE South Africa and S Mozambique.



Descriptive notes. 21–24 cm; 79–106 g. Fairly large starling with proportionately short tail. Nominate race has forehead, crown, nape and upperparts blue-green, blue sheen on uppertail-coverts, which also have faint dark spots at tip; lores blackish, ear-coverts glossy blue, forming distinctive patch; wing blue-green, bronzy epaulet on bend of wing, dark spots on tips of greater and median coverts and on tertials, prominent indentation on inner web of primaries P6–P9; tail more blue than rest of dorsal plumage; chin, throat, breast and undertail-coverts glossy blue-green, flanks, belly and thighs blue with violet sheen; iris colour ranges from white and yellow to orange or red (some regional patterns, also individual variation); bill and legs black. Sexes alike. Juvenile much duller, with underlying brown coloration, more gloss on dorsal surface, iris brown to reddish-brown; iris fully yellow by five months. Race *cyaniventris* is larger than nominate, bend of wing violet (not blue); *sycobius* is smaller, with brighter green head and neck; *nordmanni* is like previous, but has patch at bend of wing coppery (not violet). Voice. Song, often in chorus from trees, a rambling jumble of notes with whining tone. Flight call a shrill "kwee-kwee"; characteristic contact call a nasal "skweer"; alarm a harsh "shwarr". Loud wing noise in flight.
Habitat. Inhabits dry savanna woodland, in W Africa extending into desert zone. In E & S parts of range found in regions with higher rainfall, including richer woodland and cultivated areas, also gardens, largely above 500 m; above 2000 m on Ethiopian plateau, but also on coastal belt of Kenya.
Food and Feeding. Diet primarily fruit and insects. Fruit of *Ficus*, *Salvadora persica*, *Trichilia emetica*, *Carissa edulis*, *Euclea divinorum*, *Rhus*, *Olea europaea*, *Aptodytes dimidiata*, *Strychnos henningsii*, *Boscia senegalensis*, *Guibourtia coleosperma* and *Syzygium*; nectar taken from *Agave sisalana*; also ripe cereal grain taken. Insects recorded as eaten are locusts and other grasshoppers (Orthoptera), beetles (Coleoptera), termites (Isoptera), ants (Formicidae). Observed when anting with *Anoplolepis custodiens* in South Africa. Takes food discarded by people in national parks, and meat from carcases. Captive individual killed and ate frogs, lizards and baby mice (Muridae). Most food apparently collected on ground, where it hops, rather than walking or running; forages for fruit and nectar in trees, and hawks flying insects. Associates with ungulates; perches on backs of sheep, African buffalo (*Syncerus caffer*), blue wildebeest (*Connochaetes taurinus*) and Burchell's zebra (*Equus burchellii*). Generally in pairs and small flocks; sometimes up to 300 birds at fruiting trees. Large roosts (holding more than 400 individuals) formed in reedbeds, bushes or thorn trees after breeding.
Breeding. Season mainly Jun–Aug in W Africa; Apr–Jun in Sudan, and May–Sept in Ethiopia, Eritrea and Somalia; Mar–Jun in Uganda and Kenya, but some records in all months in C & E Kenya (evidence of differences in seasonality in adjoining habitats); Oct–Jan in Tanzania, Rwanda and Malawi, and Sept–Dec (mainly Oct–Nov) in Zambia; primarily Oct–Nov in Zimbabwe and South Africa, but some records also Aug–Jan. Monogamous; possible courtship feeding noted in Kenya. Nest in natural hole or old hole of barbet (Capitonidae) or woodpecker (Picidae) 0·5–16 m above ground in tree; in Eritrea reported as using tunnel in vertical bank, and in Mali old nests of White-billed Buffalo Weaver (*Bubalornis albirostris*), Abdim's Stork (*Ciconia abdimii*) and Sacred Ibis (*Threskiornis aethiopicus*) used; one record of nesting in hollow fence post; hole unlined, or lined with grass, leaves, bits of plastic and feathers. Vigorous competition for nest-sites with other hole-nesting species such as rollers (Coraciidae), parrots (Psittacidae) and sympatric sturnids. Clutch 3–5 eggs, clear blue, or blue with fine rusty spots; incubation by female alone, period 13–14 days; chicks fed by both male and female, in captivity mostly by female and nestling period 23 days. Nests parasitized by Great Spotted Cuckoo (*Clamator glandarius*) in S Africa, and reports from S & E Africa of parasitism by Greater Honeyguide (*Indicator indicator*). Some nestling mortality due to mysiasis caused by larvae of the muscid fly *Passeromyia heterochaeta*. Captive male mated with female *L. purpureus*; two hybrid young not raised successfully.
Movements. Presumed resident in most areas. At Nakuru, in Kenya, marked exodus and few birds present Nov–Jan, and wandering flocks of non-breeders noted elsewhere; on Laikipia Plateau largely a breeding visitor Apr–Sept. In W Africa, apparent movement S in dry season.
Status and Conservation. Not globally threatened. Common to locally not uncommon; widespread. Population in Kruger National Park, in South Africa, estimated at more than 32,000 individuals; in S Mozambique more than 100,000 birds, but less common in C Mozambique, where numbers estimated at minimum of 10,000 individuals. Present in many protected areas. In dry season, may cause damage to cereal crops in L Chad basin.
Bibliography. Adamson (1953), Amadon (1956), Bennun *et al.* (1990), Benson (1946b, 1962), Borrow & Demey (2001), Brooke (1968a), Carswell *et al.* (2005), Cheesman & Sclater (1936), Craig (1997g, 2000), Cunningham-van Someren (1974), Da Camara-Smeets (1988), Delpy (1972), Dittami (1983, 1987), Dowsett *et al.* (2008), Fry *et al.* (2000), Hockey *et al.* (2005), Kemp *et al.* (2001), Koenig (1994), Lack (1985), Lamarche (1981), Ledger (1969), McCarthy (2006), Meyer (1959), Michaelis (1977), Nikolaus (1987), Parker (1999, 2005), Short & Horne (2005), Smith & Schofield (2005), Tréca & Tamba (1997), Vincent, A.W. (1949), Vincent, J. (1936), Whyte (1981), Wilkinson (1984).

PLATE 47 ➤

PLATE 47


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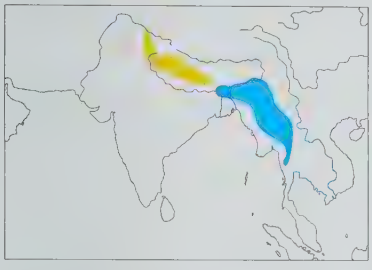
Genus *SAROGLOSSA* Hodgson, 1844

101. **Spot-winged Starling**

Saroglossa spiloptera

French: Choucador à ailes tachetées **German**: Marmorstar **Spanish**: Estornino Alipinto

Taxonomy. *Lamprotornis spilopterus* Vigors, 1831, Simla–Almora district, Himachal Pradesh, India. Monotypic.
Distribution. Breeds in Himalayan foothills in N India (Himachal Pradesh S to N Uttar Pradesh) and Nepal; non-breeding range in Assam, NE & C Bangladesh, Myanmar and W Thailand.



Descriptive notes. 19 cm; 47·5 g. Small, mostly brownish starling with pale eyes. Male has feathers of crown to mantle and back grey with dark borders, rump red-brown; wing blackish with olive sheen, white patch near base of each primary; tail dark rufous-brown; side of head grey, chin and throat dark red-brown; underparts variably chestnut-brown, often pale on chest, pale feather edges in centre of belly, thighs grey; iris white to pale yellow; bill black, brown base; legs dark brown. Female has crown, nape and upperparts grey-brown with pale spot-like areas on feathers, wings and tail dark brown, chin, throat and chest pale brown with dark central streaks, flanks, belly and undertail-coverts dull white. Juvenile resembles female but with more streaking below, brown wash on flanks, brown tips on wing-coverts, iris dark brown to grey. Voice. Song a mix of dry, harsh discordant notes and some more musical warbling. Call from flocks a noisy chattering; aggressive "chek-chek-chek" and chirruping "chik-chik" as contact call by perched individuals.
Habitat. Open forest, clearings and forest edge in hilly country at 700–1000 m, locally to 2000 m. Also in trees in open areas and cultivated areas in lowlands in non-breeding range.
Food and Feeding. Omnivorous. Diet includes fruit, insects and nectar. Berries and figs (*Ficus*) eaten, and nectar taken readily from *Bombax*, *Erythrina* and *Grevillea* trees; insect food noted as red tree ants (Formicidae) and winged termites (Isoptera). Forages mainly in canopy. Gregarious, often in flocks; also associates with *Sturnia malabarica* and *Acridotheres fuscus*.
Breeding. Season Apr–Jun. Monogamous. Nest in natural tree hole or barbet (Capitonidae) hole 6–10 m above ground, cavity lined with green leaves and other material. Clutch 3–4 eggs, pale grey or bluish-green with reddish-brown speckles and blotches; in captivity, both parents fed young and both removed faecal sacs. No other information.
Movements. Migratory. Migrates E in Jun–Jul to non-breeding grounds in NE India (Assam, Meghalaya, Nagaland, Manipur), NE & C Bangladesh, Myanmar and NW & W Thailand; recorded in Myanmar Dec–Feb; return passage W in Mar–Apr. Passage migrant in Sikkim.
Status and Conservation. Not globally threatened. Scarce in breeding areas. Rare to scarce non-breeding visitor in Myanmar and Thailand; possibly no longer occurs in Bangladesh. Seldom kept in captivity.
Bibliography. Ali & Ripley (1972), Collar *et al.* (1994), Fleming & Traylor (1968), Grimmett *et al.* (1998), Inskipp & Inskipp (1991), Lekagul & Round (1991), Marien (1951), Rasmussen & Anderton (2005b), Robson (2000), Scamell (1969), Smythies (1986), Whistler (1923).

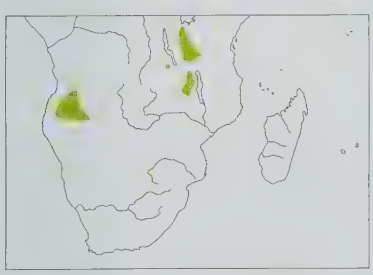
Genus *NEOCICHLA* Sharpe, 1876

102. **White-winged Babbling Starling**

Neocichla gutturalis

French: Choucador à gorge noire **German**: Weißflügelstar **Spanish**: Estornino Gorjinegro
Other common names: Babbling Starling, White-winged Starling

Taxonomy. *Crateropus gutturalis* Bocage, 1871, Huíla, Angola.
Two subspecies recognized.
Subspecies and Distribution.
N. g. gutturalis (Bocage, 1871) – SC Angola.
N. g. angusta Friedmann, 1930 – WC Tanzania, NW & E Zambia and NW Malawi.



Descriptive notes. 17 cm; 64–72 g. Small starling with distinctive plumage pattern. Nominate race has head, including chin and throat, grey, darker on lores; mantle and back brown with buff feather edges, rump grey-brown; wing brown, some gloss on primaries, white outer edges of secondaries forming prominent band on folded wing (clear wing patch in flight); tail dark brown with some gloss, white tips on outer two pairs of rectrices; small black wedge-shaped mark in centre of breast; rest of underparts buff, paling to white in centre of belly; iris yellow; bill black; legs yellow-brown. Sexes alike. Juvenile has crown and mantle dark brown, throat and underparts with dark brown teardrop markings on pale background, iris grey, bill yellowish with dark tip, legs pale brown. Race *angusta* differs from nominate primarily in having narrower white edges on outer rectrices, paler upperparts. Voice. Song of protracted plaintive sequences of notes interspersed with upslurred squealing sounds; calls described as shrill and like those of a parrot (Psittacidae), or reminiscent of babblers (Timaliidae); scolding alarm call.
Habitat. Open miombo (*Brachystegia*) woodland with little undergrowth, and mixed miombo–mopane (*Brachystegia–Colophospermum*) woodland; to c. 1500 m.
Food and Feeding. Diet includes weevils (Curculionidae) and other Coleoptera, termites (Isoptera); also berries, and observed to probe protea (*Protea*) flowers. Forages primarily on ground. In pairs or in groups of fewer than ten individuals, but flocks of more than 40 birds reported in non-breeding season; may join mixed-species foraging flocks.
Breeding. Breeds Aug–Sept/Oct in Angola, Oct–Nov in Zambia and Nov in Malawi. Presumed monogamous; co-operative breeding suspected, but not confirmed. Nest a lining of lichen, moss and grass, or hair and dry leaves, placed in hole up to 8 m above ground in tree. Clutch 2–3 eggs reported; two adults feeding at one nest. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Poorly known, with apparently relict distribution; isolated population near Nsoma, in NW Zambia. Common in Angola and in parts of E range; everywhere very localized in occurrence. Present in some protected areas.
Bibliography. Benson & Irwin (1966), Chapin (1948), Dean (2000b), Dean & Vernon (1988), Dowsett *et al.* (2008), Dowsett-Lemaire & Dowsett (2006), Friedmann (1930), Fry *et al.* (2000).

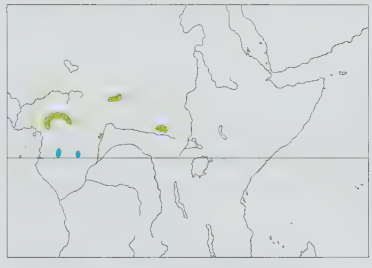
Genus *GRAFISIA* Bates, 1926

103. **White-collared Starling**

Grafisia torquata

French: Choucador à cou blanc **German**: Ringstar **Spanish**: Estornino Acollarado

Taxonomy. *Spreo torquatus* Reichenow, 1909, Banyo, western Cameroon.
Monotypic.
Distribution. Locally in C Cameroon (Adamawa Plateau and Bamenda Highlands), N Central African Republic, N PRCongo and N DRCongo; non-breeding in Gabon.



Descriptive notes. 21 cm; 61–67 g. Medium-sized, dark starling. Male is uniformly glossy blue-black, except for white patch on upper breast (ending sharply in line with wing); iris orange-yellow with deep orange outer ring; bill and legs black. Female is charcoal-grey without gloss, but feathers from crown to rump tipped blue-black, wing and tail dull black; bare parts as male. Juvenile is like female in pattern, but brownish-grey underparts, iris dark brown. Voice. Song, apparently from both sexes, and perhaps from groups perched in trees, said to be reminiscent of song of *Lamprotornis* species. Call of 3 short whistled notes, and chirruping described.
Habitat. Open woodland and savanna; recorded also in montane grassland to 1200 m in Cameroon.
Food and Feeding. Diet probably mainly fruit; insects also reported in stomach contents. Fruits of *Ficus*, *Musanga*, *Macaranga assas* and *Xylopia aethiopica*. Forages in trees with frugivores, including *Lamprotornis splendidus*; does not descend to ground. Hawks insects from treetops or above canopy. In pairs and small flocks, and once a larger flock of more than 100 individuals in Congo Basin.
Breeding. In breeding condition and possible nest-building in Cameroon in Feb–Mar. No other information.
Movements. Possible seasonal movements; non-breeding visitor in Gabon and parts of PRCongo.
Status and Conservation. Not globally threatened. Very poorly known, and status unclear. Apparently uncommon to locally common within fragmented range.
Bibliography. Bannerman (1948), Blancou (1974), Borrow & Demey (2001), Brosset & Érard (1986), Chapin (1954), Dowsett & Dowsett-Lemaire (1998), Dowsett-Lemaire (1996), Fry *et al.* (2000), Serle (1965).

Genus *SPECULIPASTOR* Reichenow, 1879

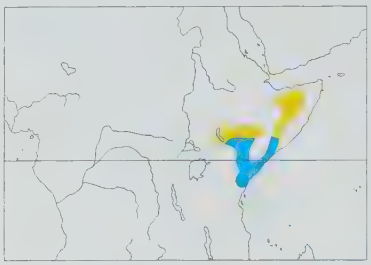
104. **Magpie Starling**

Speculipastor bicolor

French: Choucador pie **German**: Spiegelstar **Spanish**: Estornino Urraca

Taxonomy. *Speculipastor bicolor* Reichenow, 1879, Kipini, Kenya.
Monotypic.
Distribution. Breeds N Kenya, S & E Ethiopia and Somalia; non-breeding E Kenya and S Somalia.
Descriptive notes. 19 cm; 66–69 g. Small starling with white abdomen. Male has head and upperparts, chin, throat and upper breast glossy blue-black, remainder of breast region, belly, flanks, thighs and undertail-coverts white; wing blue-black, white bases of primaries visible as a white bar on folded wing (prominent white band in flight); tail blue-black; iris red; bill and legs black. Female resembles male in plumage pattern but duller, head, throat and upper breast grey, with blue-black feathers restricted to narrow band between bib and the white of lower breast and belly. Juvenile lacks blue-

On following pages: 105. Sharpe's Starling (*Pholia sharpii*); 106. Abbott's Starling (*Pholia femoralis*); 107. Narrow-tailed Starling (*Poeoptera lugubris*); 108. Kenrick's Starling (*Poeoptera kenricki*); 109. Stuhlmann's Starling (*Poeoptera stuhlmanni*); 110. Black-bellied Glossy Starling (*Notopholia corrusca*); 111. Copper-tailed Glossy Starling (*Hylopsar cupreocauda*); 112. Purple-headed Glossy Starling (*Hylopsar purpureiceps*).



black in plumage, has upperparts, chin, throat and breast grey, white areas as in adult, wings and tail grey-brown, iris dark brown, bill and legs brown. Voice. Song a soft babbling with harsher notes; captive male sang for extended periods. Flight call a shrill whistle; alarm a harsh "ti-chuk chuk-chuk".
Habitat. Open bushy and wooded country in arid to semi-arid regions, mainly below 1200 m.
Food and Feeding. Recorded items include fruit of *Ficus*, *Rhus*, *Strychnos henningsii* and *Solanum*; insects such as caterpillars (Lepidoptera). Forages on ground and in trees. Generally flocks of no more than 30 individuals but more than 100 feeding in fruiting trees on occasion.
Breeding. Season May–Jun in Kenya, possibly Feb–Apr in Ethiopia, and Apr–Jun in Somalia; perhaps breeds opportunistically in response to rainfall. Monogamous; evidence of occasional co-operative breeding. Solitary or in small colonies. Nest in hole in side of termite (Isoptera) mound when solitary, also in hole in bank when in colony, breeding chamber 10–20 cm from surface and lined with grass and green leaves; captive pair used nestbox, sparsely lined with grass. Clutch 2–6 eggs, bluish-green, lightly spotted all over with russet brown; in captivity, incubation by female, period c. 18 days, nestlings fed by both adults for 21 days.
Movements. Generally regarded as nomadic; in some areas movements appear to represent regular migration, with clearly defined breeding and non-breeding regions. N Somalia and S Ethiopia may be breeding areas only, whereas Kenya S of equator is wintering area (Aug–Oct). Vagrants recorded in NE Uganda, SE Sudan and N Tanzania.
Status and Conservation. Not globally threatened. Locally common. Occurs in arid regions unsuited to permanent human settlement.
Bibliography. Archer & Godman (1961), Ash & Miskell (1998), Benson (1946b), Carswell *et al.* (2005), Fry *et al.* (2000), Haas & Nickel (1982), Nikolaus (1987), Partridge (1964), Short & Horne (2005), van Someren (1922), Zimmerman *et al.* (1996).

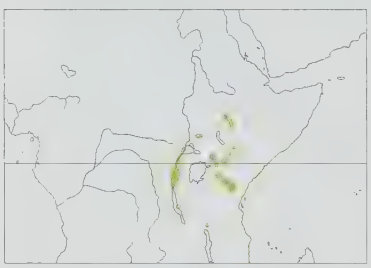
Genus *PHOLIA* Reichenow, 1900

105. **Sharpe's Starling**

Pholia sharpii

French: Choucador de Sharpe **German**: Rostbauchstar **Spanish**: Estornino de Sharpe

Taxonomy. *Pholidauges sharpii* F. J. Jackson, 1898, Eldama Ravine, Kenya.
Genus often subsumed into *Cinnyricinclus*. Has been suggested that this species and *P. femoralis* form a superspecies. Monotypic.
Distribution. SE Sudan, SW Ethiopia, extreme E DRCongo, SW Uganda, W parts of Rwanda and Burundi, Mt Elgon (E Uganda–W Kenya border), C & S Kenya, and N, W & SW Tanzania.



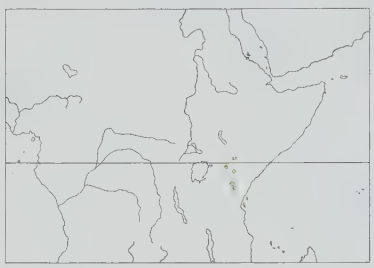
Descriptive notes. 18 cm; 40–56 g. Small starling with distinctive plumage. Has crown, side of head, nape and entire upperside, including wing and tail, glossy blue-black; chin, throat and breast cream-coloured, tinged with buff, also glossy blue-black patch on each side of breast at bend of wing (may suggest partial breastband); belly, flanks, thighs and undertail-coverts buff; iris yellow; bill and legs black. Sexes alike. Juvenile has matt grey upperparts with some sheen on wings and tail, cream-coloured below with dark arrowhead-shaped feather tips, buff wash on thighs and undertail coverts, iris dark brown, pale yellow bill base. Voice. Song, by male from songpost, a short series of very high, thin sharp whistles, rising and falling, mixed with scratchy and chattering notes, reminiscent of song of Dark-backed Weaver (*Ploceus bicolor*). Contact call a soft whistle; flight call a high "chink" or "spink".
Habitat. Montane forest in high-rainfall areas, also forest edges and clearings, and isolated copses of trees; at 1400–3000 m, mostly 1800–2500 m.
Food and Feeding. Primarily frugivorous; some insects taken. Fruits eaten include *Sapium*, *Olea*, *Bridelia*, *Eugenia capensis*, *Ocotea usambarensis*, *Urea hypselodendron*, *Rapanea pulchra*, *Ilex mitis*, *Macaranga neomildbreadiana*, *Polyscias fulva*. Forages primarily in canopy, picking fruit close at hand and seldom stretching for it; hawks alate termites (Isoptera). In flocks of up to c. 25 individuals, once more than 100; feeds in association with *P. femoralis*, *Poeoptera stuhlmanni*, *Onychognathus tenuirostris* and *Onychognathus walleri*, also with bulbuls (Pycnonotidae).
Breeding. Season Feb–Apr in Sudan and Ethiopia, Apr–Jun in W Kenya and Oct–Dec in Tanzania; likely (on basis of breeding condition of specimens) Mar–Apr in DRCongo. Nest a lining of moss placed in tree hole up to 15 m above ground. One nest contained clutch of 3 eggs. No other information.
Movements. Presumed resident, but local movements likely. Absence from Rwandan forest during Oct–Dec suggests some seasonal movements.
Status and Conservation. Not globally threatened. Locally common to uncommon. Fragmented distribution in mountains, with isolated records in W & SW Tanzania. Single record from Mafinga Mts, in extreme NE Zambia; status there unclear.
Bibliography. Beesley (1972), Benson (1946b), Brown, P. (1972), Carswell *et al.* (2005), Chapin (1954), Dorst & Roux (1973), Dowsett, Aspinwall & Dowsett-Lemaire (2008), Dowsett, Berry & Foot (2003), Dowsett-Lemaire (1990), Fry *et al.* (2000), Jackson & Sclater (1938), Moermond (1992), Moermond *et al.* (1993), Moreau & Sclater (1938), Nikolaus (1987), Taylor & Taylor (1988).

106. **Abbott's Starling**

Pholia femoralis

French: Choucador d'Abbott **German**: Abbottstar **Spanish**: Estornino de Abbott

Taxonomy. *Pholidauges femoralis* Richmond, 1897, Mount Kilimanjaro, Tanzania.
Genus often subsumed into *Cinnyricinclus*. Has been suggested that this species and *P. sharpii* form a superspecies. Monotypic.
Distribution. Highland forest in SC Kenya (E of Rift Valley) and NE Tanzania.



Descriptive notes. 17 cm. Small starling with distinctive plumage pattern. Head, entire upperparts, and chin, throat and breast are blue-black with slight sheen; wing and tail glossy blue-black; belly, flanks and undertail-coverts creamy white; iris whitish; bill and legs black. Sexes alike (erroneous descriptions in the literature based on subadult female). Juvenile is dark grey above, yellowish wash on throat and breast, dark shaft streaks on throat, breast and belly, iris dark brown. Voice. Song described as high-pitched and squeaky, with twanging notes; whistling 6-note call, 3 notes ascending and then 3 descending, may be a song or a contact call. Very high-pitched metallic calls.
Habitat. Montane forest, favouring areas of tall trees with discontinuous canopy; 1800–2600 m, ranging up to 2800 m.
Food and Feeding. Diet fruit and insects; fruit of *Cornus volkensii* recorded. Feeds chiefly in canopy, hawks insects and gleans foliage. In small flocks.
Breeding. Breeding records in Feb, Mar and Oct in Tanzania. Nest in tree hole, including old woodpecker (Picidae) hole; two broods of two nestlings recorded; chicks fed with insects by both adults. No other information.
Movements. Resident. Local movements related to fruiting of trees, with fluctuations in numbers and periodic absence from particular areas; possibly some substantial movements between forests.
Status and Conservation. VULNERABLE. Rare within small range. Some evidence of population decline at sites where formerly categorized as common. In Kenya, generally scarce and local on Mt Kenya; few recent records from Kikuyu Escarpment Forest in S Aberdare Mts, where formerly common (flocks of up to 40 observed); recorded also in Chyulu Hills (no recent records; old records of feeding flocks of up to 100 individuals) and Taita Hills. In Tanzania, quite common above 1800 m on Mt Kilimanjaro in 1977 but few recent records, and regarded as probably rare in 1991; recorded also on Mt Meru, where scarce and possibly only seasonal in occurrence; flocks of 20–25 observed at 1600 m in Kindoroko Forest Reserve, in N Pare Mts in 1993. Continuing forest loss and degradation remain major threats; little highland forest is adequately protected within the species' range. Recent surveys suggest that it is restricted to forest sections with least human disturbance.
Bibliography. Anon. (2008b), Butchart & Stattersfield (2004), Fry *et al.* (2000), Moreau (1935), Otieno *et al.* (2007), Taylor & Taylor (1988), Thomas (1962), van Someren (1939), Stattersfield & Capper (2000), Zimmerman *et al.* (1996).

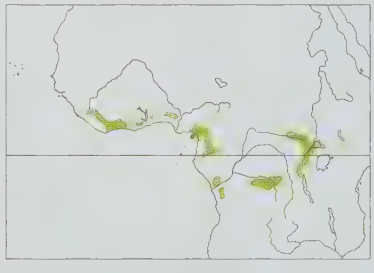
Genus *POEOPTERA* Bonaparte, 1854

107. **Narrow-tailed Starling**

Poeoptera lugubris

French: Choucador à queue étroite **German**: Spitzschwanzstar **Spanish**: Estornino Rabilargo

Taxonomy. *Poeoptera lugubris* Bonaparte, 1854, no locality = Gabon.
Monotypic.
Distribution. E Sierra Leone, N & E Liberia and S Ivory Coast; S Ghana, SW Togo, Nigeria and Cameroon S, including Bioko I (Fernando Póo), to Gabon, PRCongo and NW Angola (Cabinda S to Cuanza Norte); and SW, SC & NE DRCongo and SW Uganda.



Descriptive notes. 18 cm; 35–43 g. Small, slim, dark starling with very long, narrow, graduated tail. Male is uniformly dark glossy blue except for remiges and tail, which are black with slight gloss; iris yellow; bill and legs black. Female has body plumage grey, slight blue gloss on dorsal surface; remiges brown, chestnut patch on inner webs of primaries; tail black, proportionally shorter than in male; bare parts as for male. Juvenile resembles female but duller, with less gloss, chestnut primary patch in both sexes, tail shorter, iris dark. Voice. Flight call a shrill, cheeping in chorus; also melodious whistling calls, which are possibly contact calls.
Habitat. Lowland forest, ranging out into forest patches; also coffee plantations, regenerating patches of cultivation and old clearings with high canopy cover. Below 1000 m in Cameroon, up to 1700 m in Uganda.
Food and Feeding. Diet primarily fruit, also insects. Fruits including *Musanga*, *Rauwolfia*, *Macaranga*; also arils of *Pycnanthus*. Insects recorded in diet are butterflies (Lepidoptera), flies (Diptera), alate termites (Isoptera), flying ants (Formicidae) and beetles (Coleoptera). Forages predominantly in canopy. Most insects captured by hawking. Feeding flocks generally of 10–40 individuals, rarely up to 100; sometimes joins mixed-species flocks of frugivores, and foraging party seen with Grey-throated Barbets (*Gymnobucco bonapartei*) and White-headed Woodhoopoes (*Phoeniculus bollei*), the latter an insectivorous species. Regular roost of c. 40 individuals in village near Mt Kupe (Cameroon) in Nov each year; communal roosts noted in Congo Basin.
Breeding. Season Dec–Jan in Liberia, Jan in Nigeria and Cameroon, Dec–Mar in Gabon and Feb–Mar in Angola; in DRCongo, Dec in NE (Ituri region) and Mar and Jun–Jul in E (Kivu); Feb in Uganda. Colonial breeder. Nest in tree hole 5–8 m above ground; apparently dependent on holes provided by colonial-breeding Naked-faced Barbet (*Gymnobucco calvus*) and other members of this genus (e.g. Grey-throated Barbet), and in Uganda both barbet and starling nests found in trees utilized also by Grey-cheeked Hornbills (*Bycanistes subcylindricus*); trees apparently shared amicably, but in Cameroon present species was chased off in Mar (when barbets nesting) but tolerated in May. Clutch in one nest 3 eggs, pale blue-grey with sparse brown spots (obtained

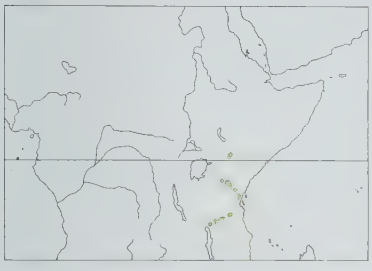
when tree felled); incubation probably by female alone (at colonies, only females seen to have bent tail); chicks fed by both parents. No further information.
Movements. Presumed resident; movements related to fruiting patterns of forest trees likely.
Status and Conservation. Not globally threatened. Not uncommon to scarce and local; locally common in Angola. Few records in Ghana and Togo, and uncommon in Nigeria. Recorded in SW Central African Republic, but status there unclear. Has extensive, but discontinuous, range in lowland forest.
Bibliography. Baranga & Kalinga (1991), Borrow & Demey (2001), Bowden (2001), Brosset & Érard (1986), Carswell *et al.* (2005), Chapin (1954), Dean (2000b), Dean *et al.* (1987), Eisentraut (1963), Fry *et al.* (2000), Gatter (1997), Germain *et al.* (1973), Heinrich (1958), Prigogine (1971), Serle (1940, 1954).

108. **Kenrick's Starling**

Poeoptera kenricki

French: Choucador de Kenrick **German**: Kenrickstar **Spanish**: Estornino de Kenrick

Taxonomy. *Paeoptera* [sic] *kenricki* Shelley, 1894, Usambara Mountains, Tanzania.
May form a superspecies with *P. stuhlmanni* and has been considered conspecific. Birds from Kenya described as race *bensoni*, supposedly larger than those in Tanzania; overlap in measurements, however, apparently considerable, and recognition of geographical races considered unwarranted. Monotypic.
Distribution. Mountains in C Kenya and NE & E Tanzania (Eastern Arc).



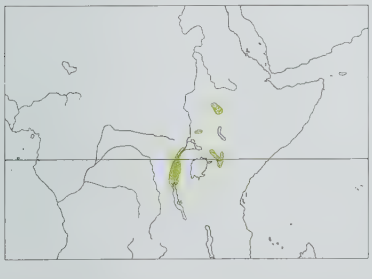
Descriptive notes. 15 cm; 46–54 g. Small, dark starling. Male is uniformly black with slight bronzy sheen; iris pale yellow; bill and legs black. Female has head, throat, breast and belly grey, upperparts, wing and tail dark charcoal-grey; chestnut patch on inner web of primaries, also on outer web of primaries P1–P8; iris yellow; bill and legs black. Juvenile has sooty plumage, with chestnut on primaries in both sexes. Voice. Musical babble from flocks; loud sweet "peleep" a possible flight call.
Habitat. Highland forests, generally in areas of high rainfall, at 900–2500 m; visits isolated forest patches. In Tanzania, recorded also at 450 m in E Usambaras, where found at forest edges or in agricultural smallholdings.
Food and Feeding. Exclusively frugivorous; *Ficus* and *Trema* recorded in diet. Feeds in canopy, in noisy flocks of 16–30 individuals, often with *Onychognathus walleri*.
Breeding. Recorded in Jan, Mar–May, Jun–Jul and Sept–Nov; main season in Oct. Nest in tree hole; seen at old holes of woodpecker (Picidae) and barbet (Capitonidae). No other information.
Movements. Very poorly known. Apparently nomadic, wandering widely; possible altitudinal movements in Eastern Arc forests of Tanzania.
Status and Conservation. Not globally threatened. Restricted-range species: present in Tanzania-Malawi Mountains EBA and in Kenyan Mountains EBA. Fairly common but local. Poorly known species, for which there is very little biological information.
Bibliography. Amadon (1956), Borghesio *et al.* (2008), Bowen (1931a), Brown (1965), Brown & Britton (1980), Burgess & Mlingwa (2000), Fry *et al.* (2000), Fuggles-Couchman (1984), Fuggles-Couchman & Elliott (1946), Lack (1936), Sclater & Moreau (1933), Zimmerman *et al.* (1996).

109. **Stuhlmann's Starling**

Poeoptera stuhlmanni

French: Choucador de Stuhlmann **German**: Stuhlmannstar **Spanish**: Estornino de Stuhlmann

Taxonomy. *Stilbopsar stuhlmanni* Reichenow, 1893, Badjua, on plateau west of Lake Albert, DRCongo.
May form a superspecies with *P. kenricki* and has been considered conspecific. Monotypic.
Distribution. SW Ethiopia, S Sudan (Imatong Mts), extreme E DRCongo, SW Uganda, Rwanda and Burundi, Mt Elgon (Uganda–Kenya border), W Kenya and W Tanzania (W of Rift Valley).



Descriptive notes. 15 cm; 38–46 g. Small, dark starling. Male has head, nape, and chin to breast dark blue-black with blue sheen; upperparts and belly, flanks, thighs and undertail-coverts black with purple sheen; wing and tail black; iris yellow outer ring, dark brown inner ring; bill and legs black. Female is dark grey, with bluish sheen on head, nape, throat and breast, slight purple gloss on back and blue gloss on rump; centre of belly, thighs and undertail-coverts matt grey; wing and tail black, inner webs of all primaries and outer webs of primaries P1–P8 chestnut-brown; iris with yellow outer ring, bill and legs black. Juvenile resembles female, but browner upperparts, grey-brown underparts, both sexes with chestnut primary patch, iris brown. Voice. Song a string of whistles and chuckles. Contact call musical "prtlee" or variants, typically disyllabic or trisyllabic.
Habitat. Highland and montane forest, generally at 1500–2600 m.
Food and Feeding. Diet apparently entirely fruit, including *Ficus*, *Trema*, *Urera*, *Olea*, *Sapium*, *Schefflera*, *Ilex mitis*, *Macaranga neomildbreadiana*, *Alangium chinense*, *Polyscias fulva*, *Maesa lanceolata*. Forages primarily at middle levels and in canopy. In pairs and small groups; not a member of mixed-species flocks in Itombe region of DRCongo, but elsewhere seen feeding in flocks alongside bulbuls (Pycnonotidae), white-eyes (Zosteropidae) and barbets (Capitonidae); sometimes with flocks of *Onychognathus walleri*.
Breeding. Breeds Mar in Ethiopia, Apr in Sudan, Feb–Mar in Uganda and Jun in E DRCongo (Kivu region); recorded Dec and Mar in Kenya. Nest in tree hole at least 10 m above ground. No other information. Pair in Kenya seen to chase *Indicator* honeyguide, suggesting that brood parasitism may occur.
Movements. Presumed resident, with local movements related to fruiting patterns.
Status and Conservation. Not globally threatened. Common within its limited range.
Bibliography. Brown (1975), Carswell *et al.* (2005), Chapin (1954), Cunningham-van Someren (1975), Dowsett-Lemaire (1990), Fry *et al.* (2000), Jackson & Sclater (1938), Moermond *et al.* (1993), Nikolaus (1987), Prigogine (1971), Zimmerman (1972).

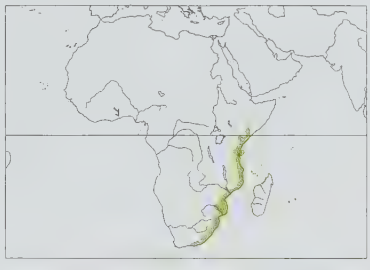
Genus *NOTOPHOLIA* Roberts, 1922

110. **Black-bellied Glossy Starling**

Notopholia corrusca

French: Choucador à ventre noir **Spanish**: Estornino Ventrinegro
German: Schwarzbauch-Glanzstar
Other common names: Black-bellied Starling, Black-breasted Glossy Starling

Taxonomy. *L[amprotornis] corrusca* Nordmann, 1835, Southern Africa = Eastern Cape, South Africa.
Genus often subsumed into *Lamprotornis*. Two subspecies recognized.
Subspecies and Distribution.
N. c. corrusca (Nordmann, 1835) – S Somalia S in narrow belt along coast to Kenya, Tanzania, Mozambique and E South Africa, extending inland along some major rivers (thus reaches extreme SE Zimbabwe).
N. c. vaughani (Bannerman, 1926) – Pemba I, off NE Tanzania.



Descriptive notes. 18 cm; 51–68 g. Rather small and short-tailed, dark starling. Male nominate race has crown, nape and mantle glossy dark green, some iridescent blue on ear-coverts; back, rump and uppertail-coverts dark green with violet-blue gloss; wing dark blue-green with some gloss, outer edges of primaries violet-blue; tail dark violet-blue; chin, throat and upper breast glossy dark green, lower breast and belly dark violet-blue with bronzy sheen, thighs dark green with violet-blue gloss; iris orange-yellow, but red for variable period during breeding (when handled, can also change colour of only one eye at a time, presumably by redirecting blood circulation); bill and legs black. Female is like male, but lower breast and belly matt black without gloss. Juvenile is sooty black, lacking gloss, with iris grey. Race *vaughani* is larger than nominate, with entire head glossy purple, instead of greenish. Voice. Song a sustained jumble of trilling and piping notes, harsher and less musical than that of *Lamprotornis nitens*; mimicry of at least ten other bird species reported from Zanzibar, Mozambique and South Africa. Flight call a single nasal note; alarm call harsh "jaaa".
Habitat. Coastal forest and dense vegetation, in E Usambaras (Tanzania) primarily on forest edge or agricultural smallholdings; on Pemba I, race *vaughani* regular in forest and coral-rag scrub, absent from farms and clove (*Syzygium aromaticum*) plantations. Lowlands below 500 m, but to 1000 m in E Usambaras and to at least 2000 m in Meru forests (EC Kenya).
Food and Feeding. Diet primarily fruit, also nectar, also insects and other small animals. Many fruits taken: *Ficus*, *Clerodendron myricoides*, *Lantana*, *Sapium manianum*, *Clausena anisata*, *Grevillea*, *Dovyalis longispina*, *Euclea natalensis*, *Trema orientalis*, *Halleria lucida*, *Ekebergia capensis*, *Apodytes dimidiata*, *Mimusops caffer*, *Sideroxylon inerme*, *Rotheca myricoides*, *Protorhus longifolia*, *Commiphora harveyi*, *Rauwolfia membasiana*, *Beinbollia borbonica*, *Croton sylvaticus*, *Antidesma venosum*, *Margaritoria discoidea*, *Bridelia micrantha*, *Melia azederach*, *Olea capensis*, *Osyris lanceolata*, *Acacia cyclops*, *Rapanea melanophloeos*, *Morus*, *Harpephyllum caffrum*, *Trichilia emetica*, *Phoenix reclinata*, *Acokanthera oppositifolia*. Nectar of *Aloe marlothii* taken. Animal food items include reed frogs (*Hyperolius*), small lizards, snails (Gastropoda), flying ants (Formicidae) and alate termites (Isoptera). Forages mainly in trees, but also on ground. In small to medium-sized flocks.
Breeding. Season Oct–Jan throughout range, with occasional breeding records in other months. Monogamous. Nest a lining of grass, hair, feathers and dry leaves placed in tree hole, either natural hole or old hole of barbet (Capitonidae) or woodpecker (Picidae), 2·5–6 m above ground; one nest recorded in a building. Clutch 2–4 eggs, pale greenish-blue, rarely with faint brown spotting; only female incubates, male perching nearby and warbling, chicks fed by both sexes; no information on duration of incubation and nestling periods.
Movements. Presumed resident on Pemba (race *vaughani*); birds on Zanzibar not distinct, implying interchange with other populations. Elsewhere no regular pattern of seasonal movement, and in many areas present all year, although numbers fluctuate dramatically. Inland in Mozambique and Zimbabwe apparently a breeding visitor; at W limit of range in South Africa a winter visitor, common only during fruiting periods of *Rapanea melanophloeos*. N–S movements along E African coast seem likely.
Status and Conservation. Not globally threatened. Locally common, and abundant in some areas. Wide-ranging. Estimated population exceeding 10,000 individuals in C & S Mozambique. Possibly only a non-breeding visitor in Somalia.
Bibliography. Amadon (1956), Ash & Miskell (1998), Bleher *et al.* (2003), Borghesio *et al.* (2008), Britton & Britton (1970), Catry *et al.* (2000), Chittenden & Myburgh (1994), Craig (1989, 1997b), Frost (1980), Fry *et al.* (2000), Gilges (1945), Hockey *et al.* (2005), Holland (1945), Koen (1992), Lack (1936), McCulloch (1963), Nixon (1992), Oatley & Skead (1972), Odgers (1993), Pakenham (1936, 1979), Parker (1999, 2005), Pinto & Lamm (1956), Pooley (1967), Swynnerton (1908), Tree (1986), Vernon (1973, 1993).

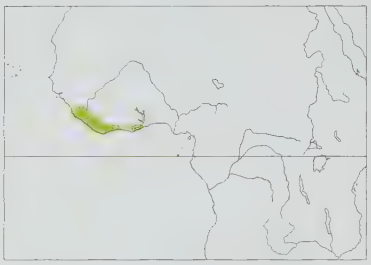
Genus *HYLOPSAR* Boetticher, 1940

111. **Copper-tailed Glossy Starling**

Hylopsar cupreocauda

French: Choucador à queue bronzée **German**: Kupferglanzstar **Spanish**: Estornino Colicobrizo
Other common names: Copper(y)-tailed Starling

Taxonomy. *Lamprocolius cupreocauda* Hartlaub, 1857, Sierra Leone, Aguapim (SE Ghana) and Gabon [error].
Genus often subsumed into *Lamprotornis*. Forms a superspecies with *H. purpureiceps*. Monotypic.
Distribution. Sierra Leone, SE Guinea, Liberia, Ivory Coast and Ghana.



Descriptive notes. 18 cm; 51–66 g. Fairly small, dark starling with shortish tail. Crown and nape are turquoise blue with purple sheen, mantle, back and wing turquoise blue, rump and tail glossy bronze; chin, throat and upper breast purple, passing into turquoise blue on lower breast, belly and flanks; undertail-coverts matt charcoal, some feathers with violet tips; iris yellow; bill and legs black. Sexes alike. Juvenile is matt charcoal-grey, some gloss on wings and tail, iris initially dark. Voice. Song described as a jumble of harsh notes. Flight calls harsh, grating notes.
Habitat. Primary lowland evergreen forest, including forest edge and gallery forest; observed also in logged forest, plantations and areas of shifting cultivation in forest zone.
Food and Feeding. Diet insects and fruit, latter including *Ficus* and *Rauwolfia*. Forages chiefly in canopy; searches for insects also in middle storey of forest. In pairs and small groups; occasionally joins mixed-species flocks of insectivores.
Breeding. On basis of activity at nest-holes and presence of juveniles, season Oct–Dec in Sierra Leone and Liberia, Nov and Jan in Ivory Coast and Aug in Ghana. Nest in hole up to 15 m above ground in tree, apparently favouring dead emergent or relict trees. Adult observed accompanied by three fledglings. No other information.
Movements. Presumed resident.
Status and Conservation. Not globally threatened. Currently considered Near-threatened. Generally common to not uncommon; probably declining. Density of 2–4 pairs/km² recorded in mature forest in Liberia. In Ivory Coast, abundant in Taï Forest National Park, and quite common in 1980s in Yapo Forest; recently noted as being fairly common in Mt Péko National Park. Appears common and widespread in Ghana, but only small flocks of 5–10 individuals observed in recent surveys. Restricted to Upper Guinea forests of W Africa, where deforestation continues throughout range. Civil war and political instability have compromised the security of forest reserves in the region.
Bibliography. Allport *et al.* (1989), Anon. (2008b), Borrow & Demey (2001), Butchart & Stattersfield (2004), Colston & Curry-Lindahl (1986), Dutson & Branscombe (1990), Fry *et al.* (2000), Gartshore (1989), Gatter (1997), Stattersfield & Capper (2000), Thiollay (1985), Walker (1939).

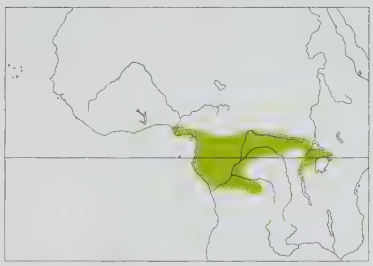
112. **Purple-headed Glossy Starling**

Hylopsar purpureiceps

French: Choucador à tête pourprée **German**: Samtglanzstar **Spanish**: Estornino Cabecipúrpura

Other common names: Purple-headed Starling, Velvet-headed Glossy Starling

Taxonomy. *Lamprocolius purpureiceps* J. Verreaux and É. Verreaux, 1851, West Africa = Gabon.
Genus often subsumed into *Lamprotornis*. Forms a superspecies with *H. cupreocauda*. Monotypic.
Distribution. S Nigeria and S Cameroon E to S Central African Republic, Uganda and W Kenya, S to N Angola (Cabinda) and SW, N & NE DRCongo.



Descriptive notes. 18 cm; 50–79 g. Fairly small, short-tailed dark starling. Crown, chin, throat and chest are deep glossy purple, sharply demarcated from adjacent plumage areas; nape, mantle, back and rump glossy greenish-blue; wing iridescent blue, shading to violet on outer margins of primaries; tail black with faint purple gloss; belly and flanks glossy greenish-blue, undertail-coverts black with blue or bronze sheen; iris dark brown; bill and legs black. Sexes alike. Juvenile is matt charcoal-grey, except for some gloss on wings. Voice. Song apparently a series of short, musical calls; sings in chorus, and imitations of Common Bulbul (*Pycnonotus barbatus*) and Chestnut Wattle-eye (*Dyaphorophyia castanea*) reported. Flight call a metallic "twink".
Habitat. Evergreen lowland forest, generally to 1500 m; to 1800 m in E of range.
Food and Feeding. Mainly frugivorous; some animal food also taken. Fruits consumed include those of *Ficus*, *Rauwolfia*, *Heisteria*, *Musanga*, *Pycanthus*, *Morinda*, *Xylopia*, *Allophyllus*, *Macaranga*, *Polyalthia*, *Trichoscypha*. Small snail (Gastropoda) and insects, including termites (Isoptera), caterpillars (Lepidoptera), grasshoppers (Orthoptera) and mantids (Mantodea), reported in stomach contents. Forages primarily in canopy. Mostly in pairs or in groups of 4–5 individuals, rarely in flocks exceeding 100 birds; joins mixed-species flocks of frugivores. Dominated by *Lamprotornis splendidus* and by hornbills (Bucerotidae); in presence of these, forages lower down, in understorey.
Breeding. Breeds Mar in Cameroon and Dec–Feb in Gabon; in DRCongo, Jun–Oct in NE and Dec–Mar in Kivu region; Apr in Uganda. Monogamous. Nest in tree hole up to 26 m above ground; hollow of one nest lined with small pieces of green leaves. In one nest, clutch of 3 eggs, blue with brown spotting forming a ring at thicker end; at another nest chicks fed by both adults. No other information.
Movements. Presumed resident, with local movements related to fruit availability.
Status and Conservation. Not globally threatened. Locally common in much of range; not uncommon in Cabinda (N Angola). Record from Benin in 1998. Widely distributed in lowland forest. Reported occurrence in Guinea and W Ivory Coast, where similar *H. cupreocauda* found, requires corroboration.
Bibliography. Borrow & Demey (2001), Brosset & Érard (1986), Carswell *et al.* (2005), Chapin (1954), Christy & Clarke (1994), Dean (2000b), Dowsett-Lemaire (1996, 1998), Fry *et al.* (2000), Githiru & Dejene (2008), Herroelen (1955), Marchant (1953), Prigogine (1971).

Class AVES

Order PASSERIFORMES

Suborder OSCINES

Family PASSERIDAE (OLD WORLD SPARROWS)



- Small passerines with thick, pointed, conical bill, broad and mostly blunt wings, and relatively short tail; plumage various combinations of brown, chestnut, grey and white, most with some black areas, some also with yellow.
- 12–17·5 cm.



- Afrotropical, Palearctic and Oriental Regions.
- Open country, villages and urban areas.
- 6 genera, 40 species, 101 taxa.
- No species threatened; none extinct since 1600.

Systematics

The systematics of the family Passeridae have been controversial. The linguistic confusion arising from the English vernacular names of "weaver finches" and "passerine finches", the latter included in the large seed-eating grouping of the "Old World finches", has added to the problem. These names imply relationships with particular families, the finches (Fringillidae) and the weavers (Ploceidae), respectively. The use of the term "sparrow" by the early English-speaking settlers in North America as a substantive name for many species of bunting (Emberizidae) has not helped. In the argument leading to their present classification, the term "Old World sparrows" is employed to describe the taxon including the "true" sparrows, the rock-sparrows, the bush-sparrows, the snowfinches and the ground-sparrows.

Old World sparrows are seed-eaters and, apart from recent introductions, they are confined to the Old World, where they are found in the continents of Africa, Europe and Asia. This suggests that they are more likely to be related to the Old World seed-eating families with ten primaries, namely the weavers, the waxbills (Estrildidae) and the indigobirds (Viduidae), than to the largely New World families of the finches and the buntings and allies with nine primaries, although it is not clear if these two groups of seed-eating birds are related to one another evolutionarily or merely through convergence to a common way of life.

Linnaeus, in his *Systema Naturae* of 1758, attempted a classification illustrating the relationships among species. This was, in fact, a classification based on a creationist concept, rather than an evolutionary one. The relationship between these two concepts in classification, the one based on physical resemblances owing to shared characteristics, termed the "phenotypical species concept", and the natural or evolutionary one based on perceived biological relationships, the "biological species concept", still exists, and it results in disagreement about the systematics, although the two apparoaches, in theory, have the same goal.

In 1758 Linnaeus listed only two species of Old World sparrow, the House Sparrow (*Passer domesticus*) and the Eurasian Tree Sparrow (*Passer montanus*), but in 1766 he added two more, the Common Rock-sparrow (*Petronia petronia*) and the White-winged Snowfinch (*Montifringilla nivalis*). These four species, covering the three well-recognized genera of this family, were all given the generic name *Fringilla*, or "finch", although it should be noted that Linnaeus did not recognize any groupings between order and genus, the term "family" not coming into use until after 1800. The generic name of *Passer* was adopted for the House and Eurasian Tree Sparrows in 1760, *Montifringilla* for the snowfinch in 1828 and *Petronia* for the Common Rock-sparrow in 1829, but these birds were still considered by implication to be finches, and they were listed as such by R. B. Sharpe in his 1888 *Catalogue of Birds in the British Museum*, although, nearly 40 years earlier, F. de Lafresnaye had suggested that the *Passer* sparrows might be allied with the weavers on the grounds of similarities between the two in nest construction and breeding biology. Things changed in the twentieth century, leading J. M. Winterbottom to make the following statement in 1966: "The classification of the thick-billed seed-eating passerines and their allies has been one of the most controversial aspects of avian systematics today."



The true sparrows in the genus Passer *share many characteristics. They are similar to each other in size, body structure and behaviour, and are gregarious and social in almost every aspect of their lives. In most species, like the* ***House Sparrow****, males have strongly patterned heads and black bibs, which are lacking in females. The House Sparrow is considered to have evolved only 10,000 years ago, when humans first formed settled farming communities. This association has continued ever since. Altogether, 17 of the 26* Passer *sparrows have been recorded nesting on buildings and feeding in and around human settlements.*

[*Passer domesticus parkini*, Gujarat, India.
Photo: Amano Samarpan]



Apart from recent introductions, the Passeridae are confined to the Old World continents of Africa, Europe and Asia. Evidence suggests an Afrotropical origin for the genus Passer, *about 40 million years ago, and they may have spread to Eurasia around two million years ago, where they were separated into isolated populations by the Pleistocene glaciations, giving rise to the different species. The* ***Russet Sparrow*** *probably evolved from a population trapped in an ice-free refugium in the Yangtze Valley during the last Pleistocene glaciation, 25,000–15,000 years ago.*

[*Passer rutilans*, Sat Tal, Uttarakhand, India. Photo: Marc Guyt/AGAMI]

In the 1920s, P. P. Sushkin followed Lafresnaye, not only on the grounds of nest construction, but also because of the structure of the horny palate and the course of the moult, although, in hindsight, not very convincingly, and he suggested that the Old World sparrows should be transferred to the weavers as a distinct subfamily, Passerinae, that had evolved from the sparrow-weavers (*Plocepasser*). Sushkin specifically mentioned that the genera *Passer*, *Petronia* and *Montifringilla* were intimately related, exhibiting similarities in skeletal structure, relief of the palatal surface of the horny bill, a complete post-juvenile moult and nest architecture. This suggestion was adopted in the major bird classifications by C. Vaurie in 1959 and in J. L. Peters's *Check-list of Birds of the World* in 1962, although not without some dissension. G. L. Bates, for example, objected on the grounds that, on sparrows, the outermost remix is displaced to the dorsal surface of the wing, as it is on finches and buntings. As early as 1948, D. A. Bannerman, on the basis of doubts about the true affinity of the sparrows, suggested, with considerable perspicacity, that they should be treated as distinct from the Fringillidae and the Ploceidae and be given full family rank. Since then, there have been increasing suggestions that the Old World sparrows, particularly *Passer*, be considered a separate family, although, even as late as the 1970s, doubts were still being expressed about the composition of this family. For example, on the basis of examination of the karyotypes (the appearance of the chromosomes in a somatic cell of a species), N. S. Bulatova and colleagues considered that *Montifringilla*, then including *Pyrgilauda*, and *Petronia* were closer to the finches than they were to the *Passer* sparrows. In contrast, T. N. Pocock pointed out that the presence of certain small foramina in the posterior wall of the orbit argued in favour of *Petronia* being related to *Passer*. Although this character has been shown to have little taxonomic value, it does illustrate the trend in thinking, even though many of the criteria used at the time have subsequently proved to be of dubious worth. A more convincing study of the appendicular mycology, undertaken by G. D. Bentz, indicated that the three genera *Passer*, *Petronia* and *Montifringilla* are, indeed, closely related.

Further support for the separation of the sparrows is given by recent biochemical investigations by C. G. Sibley and his coworkers. These have involved electrophoretic patterns of egg-white proteins and a long series of experiments with DNA–DNA hybridization. The somewhat contradictory evidence from the egg-white proteins, in which the five species of *Passer* investigated differed from the ploceids, led Sibley to the conclusion that a distinct family, Passeridae, should be recognized, although he considered that the relationship of the snowfinches was probably not with the sparrows. This view was, however, revised in the light of the DNA–DNA hybridization work, with the sparrows relegated to a subfamily Passerinae within a larger family Passeridae that included as other subfamilies not only the weavers, but also the wagtails and pipits (Motacillidae), the accentors (Prunellidae) and the waxbills. In this later work, *Montifringilla* is restored to its position with *Passer* and *Petronia*, and the Old World sparrows are considered to be the most primitive of all the subfamilies on the basis of bill structure, biochemical evidence and pterylosis, having separated from the ploceids about 36 million years ago, the time marker being the separation of the flightless ostriches (Struthionidae) and rheas (Rheidae) 80 million years ago by the splitting of Africa and South America, coupled with the assumption that DNA evolution proceeds at a uniform rate in birds.

The sparrows probably originated in a semi-arid to arid grassland habitat with scattered trees. This is still the typical habitat for many of the true sparrows. Some however, including the ***Saxaul Sparrow****, have moved into desert or semi-desert. This species is particularly associated with saxaul trees* (Haloxylon ammodendron), *whose seeds are an important food for this sparrow. The Passeridae have the thick, conical bills typical of seed-eating passerines. The bills of male* Passer *sparrows become black in the breeding season, and are horn-coloured at other times.*

[*Passer ammodendri*, Mongolia. Photo: Roland Seitre]



An earlier investigation by V. Ziswiler on the technique of dehusking the seeds, the structure of the horny palate and the morphology of the alimentary tract provided good evidence for separating the Old World sparrows from the finches, but it was not conclusive with regard to their relationship with the weavers. More thorough investigation of the structure of the tongue, carried out by W. J. Bock and J. J. Morony, has given the best evidence for placing them in a separate family. These workers found a unique skeletal structure in the tongue which they named the preglossale, a new feature of complex structure that was, in their opinion, clearly a derived character that is lacking in the weavers and finches and hence of significant taxonomic value, and which was already present in the ancestors of the Old World sparrows. Sibley and J. E. Ahlquist countered that the preglossale may have been present in the ancestor of all the ploceids, but lost in all except the Passerinae, although this sounds a little like special pleading.

In addition to the caveat by Sibley regarding the preglossale, there are some other unresolved discrepancies. Taxonomy depends on perceived relationships, but the problem lies in differentiating between those characters that show genuine relationships and those that are the result of convergence. The fossil record provides little help in elucidating the systematics of the sparrows, but it does provide some ideas on their evolutionary history. The earliest fossil comes from the Oligocene in Africa, 38–24·6 million years ago, close to the figure suggested by Sibley for the separation of the Passerinae ancestor. The family Passeridae is, apart from recent introductions, entirely confined to the Old World, with the snowfinches and ground-sparrows restricted to higher altitudes in Eurasia, mainly in Asia.

The true sparrows, those in the genus *Passer*, form a homogeneous taxon, its members sharing a large number of characteristics. They are almost entirely social species, similar to each other in size, body structure and behaviour; for example, they are among the very few groups of birds that indulge in both bathing in water and dusting in sand or dust. Almost all breed in colonies or loosely colonial groups. Many are associated with man, his animals and his agricultural crops, and frequently nest on man-made buildings; the nests, whether free-standing in trees or in cavities, are domed over. The bill of the males becomes black in the breeding season, and in some of the species so also does that of the females; the bill of some species is black throughout the year. Three of the 26 species, the Sudan Golden Sparrow (*Passer luteus*) and the Arabian Golden Sparrow (*Passer euchlorus*), both formerly placed in the genus *Auripasser*, and the Chestnut Sparrow (*Passer eminibey*), formerly placed in a monotypic genus *Sorella*, are now accepted as belonging to the genus *Passer*.

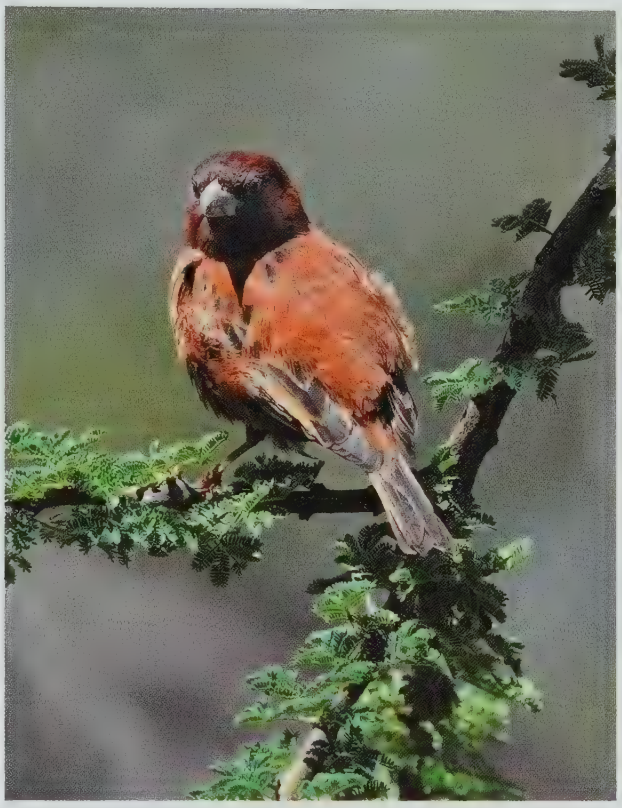
There is compelling evidence for an Afrotropical origin of the true sparrows, genus *Passer*, about 40 million years ago. The first evidence for *Passer* in Eurasia comes from fossil remains in the Levant about 300,000 years before present, where presumably a true sparrow of the black-bibbed type, the type to which all the Eurasian *Passer* belong, spread from the Afrotropical Region during the upheaval associated with the transition from the Pliocene to the Pleistocene, some two million years ago. J. D. Summers-Smith has suggested that these birds colonized Eurasia, but were subsequently separated into isolated populations by the Pleistocene glaciations, giving rise to the different species of Eurasian *Passer*. Fossil sparrows identified as House Sparrows have been recorded from deposits in France dating to as early as 120,000 years before present, but it is doubtful if these can be other than House Sparrow precursors, as it is considered that *Passer domesticus* (*sensu stricto*) did not evolve until it developed its association with sedentary agricultural man about 10,000 years ago. These early European sparrows presumably were forced southwards by the Pleistocene glaciations to the Mediterranean, where they were isolated and consequently split into the House Sparrow in the east and the Spanish Sparrow (*Passer hispaniolensis*) in the west. Finally, the position of the Italian Sparrow (*Passer italiae*) has to be considered. This taxon has been treated as a subspecies variously of the House Sparrow and of the Spanish Sparrow, and it has even been suggested that all three taxa be merged into one species. More recently, however, D. Fulgione and co-authors have proposed that *italiae* is a separate species that has evolved from *hispaniolensis* and has secondarily made contact with *domesticus* in the Alpine region, giving rise to the current hybrid zone, although it has to be recognized that this still does not account satisfactorily for the broad zone of intermediates between "pure" *italiae* and "pure" *hispaniolensis* that extends from south of Naples, in southern Italy, to at least as far south as Malta.

It is generally accepted that the grey-headed sparrows of sub-Saharan Africa constitute a superspecies of five species that can



The five grey-headed sparrows of sub-Saharan Africa were previously lumped as the Common Grey-headed Sparrow (Passer griseus). *They are separated on the grounds that there are small areas where the different taxa overlap without interbreeding, as well as some minor differences in habitat choice and morphology. The* ***Parrot-billed Sparrow****, the largest member of this superspecies, is found in more arid country than the others of this group. Its heavy, arched bill gives it a distinctive "Roman-nosed" appearance. The grey-headed sparrows differ from their black-bibbed congeners in that the sexes are similar, and in both sexes the bill remains black throughout the year.*

[*Passer gongonensis*, Samburu National Park, Kenya.
Photo: Theodoulos Poullis]





*The rather colourful **Chestnut Sparrow**, and Arabian Golden* (Passer euchlorus) *and **Sudan Golden Sparrows**, were formerly assigned to separate genera, but are now accepted as belonging to* Passer. *These species have been described as "sesquimorphic", in that the plumage of the sexes is broadly similar, but the female is distinctly paler or duller. The Sudan Golden Sparrow has a chestnut mantle, scapulars and back, which are yellow in the Arabian species. The two golden sparrows form a superspecies, to which some authorities add the Chestnut Sparrow.*

[Left: *Passer eminibey*, Serengeti National Park, Tanzania. Photo: Ketil Knudsen.

Right: *Passer luteus*, Senegal. Photo: Roland Seitre]

be separated by the fact that there are small areas where the different taxa overlap without interbreeding, although they may intergrade in other parts. The rufous sparrows occur in six allopatric populations. The ones inhabiting the Cape Verde Islands, off the coast of West Africa, are now recognized as a distinct species; it is probable that these and the other five were separated by the same geological/climatic events as those that separated the grey-headed sparrows, but the rufous sparrows, being adapted to rather more arid conditions, have not yet come into contact again in the way that has happened with the less arid-loving grey-headed sparrows. On this basis, it seems sensible to treat the rufous sparrows as constituting six separate species belonging to a superspecies. This gives a total of 26 species in the genus *Passer*.

The six species of rock-sparrow were formerly lumped together in the genus *Petronia*, but current opinion recognizes that these are sufficiently distinct to be placed in three separate genera. The Pale Rock-sparrow (*Carpospiza brachydactyla*) differs from the others in its triangular-shaped wings, giving it an ap-



*The group of six rock- and bush-sparrows is divided into three genera, two of which are monotypic. The **Pale Rock-sparrow** differs from the others in its long triangular wings, which in flight give it an appearance more like a lark (Alaudidae) than a sparrow. Some authorities even suggest that it is not a sparrow at all, but a cardueline finch (Fringillidae), on the basis of its song, its nest and eggs, and the fact that its post-juvenile moult is only partial rather than complete as in other sparrows. However, its affinity with sparrows is supported by the structure of its horny palate and its digestive tract.*

[*Carpospiza brachydactyla*, Oman. Photo: Markus Varesvuo]



Although still often known as petronias, the rock-sparrows, or bush-sparrows of the genus Gymnoris *are more arboreal than the* Petronia *and* Carpospiza *species. They have relatively slender bills and narrow, slightly forked tails, and are much less social than the Common Rock-sparrow* (Petronia petronia). *The* ***Russet-browed Bush-sparrow****, also known as the Bush Petronia, is usually seen singly, in pairs, or in small family groups. Like others of the rock-sparrow group, with the exception of the Pale Rock-sparrow* (Carpospiza brachydactyla), *this species has a yellow spot on its throat, which is often inconspicuous.*

[*Gymnoris dentata dentata*, Wadi Saham, Yemen. Photo: Hanne & Jens Eriksen]

pearance in flight more like that of a lark (Alaudidae); it also builds an open cup-nest in a low bush. This and other characteristics, such as the fact that the post-juvenile moult is only partial, compared with the complete moult of other sparrows, have led H. Mendelssohn and others to suggest that it is not even a sparrow but, rather, a cardueline finch. Nevertheless, internal characteristics such as the cranium, and the structure of the horny palate and the digestive tract, confirm its relationships with the sparrows, although it is sufficiently distinct to be placed by itself in a separate, monotypic genus, *Carpospiza*. The story does not end there. The five remaining rock-sparrows fall into two distinct groups. One consists solely of the Common Rock-sparrow, which is confined to the Palearctic Region, is terrestrial in behaviour, and is associated with open, often barren, rocky ground. The second group contains the remaining four species, which occur widely over the Afrotropical, southern Palearctic and Oriental Regions and are more arboreal, living in open dry country with scattered trees, wooded savanna or open woodland; these are perhaps more appropriately termed "bush-sparrows" and are treated as belonging to a separate genus, *Gymnoris*, which is separated from *Petronia* on the basis of body structure and behaviour. *Petronia* has a short square tail with white terminal spots and longer wings, whereas the tail of *Gymnoris* is slender and slightly forked and lacks the white terminal spots; the bill of *Petronia* is heavy and conical, while that of *Gymnoris* is pointed and slender. *Petronia*, with its noticeably bouncy flight, is a highly social species, breeding mainly in loose colonies with up to 100 pairs, the nests at times separated by only a few metres. Its nest, usually placed in a crevice in a rock, a hole in an earth bank or a rodent burrow, is domed over like those of the *Passer* sparrows; it is largely terrestrial, and normally found in large flocks outside the breeding season. In contrast, *Gymnoris* species are much less social, at times in small flocks, but normally breeding in isolated pairs. They nest in tree cavities with usually only a pad of nest material, and are largely arboreal, using the pointed bill to obtain insects under tree bark, although they forage also on the ground.

Larger and more finch-like than the other members of Passeridae, the snowfinches differ further from them in that they predominantly run, rather than hop. They are confined to high altitudes, mainly in Asia, one species, the White-winged Snowfinch, extending its range to high elevations in the extreme south-west of Europe. Because of the general inaccessibility of their habitat, the snowfinches have, with the exception of the wide-ranging White-winged Snowfinch, received comparatively little study in the field until the last two decades. Until recently, all eight species were generally combined in the genus *Montifringilla*. They do, in fact, belong to two distinct groups. First, the three "true" snowfinches are confined to rocky habitats, which, as suggested by their vernacular name, they do not leave in the winter; furthermore, they fly freely, are loosely social, and roost and nest in crevices in cliffs or under rocks. The second group contains the five ground-sparrows, which differ in that they occupy an alpine steppe habitat, descend to lower levels in the winter, and are much more adapted to the ground than the snowfinches, running more than flying; they are territorial and tend to be associated with small rodents, in the burrows of which they roost, nest and seek refuge from predators.



Larger and stouter than others in the rock-sparrow group, the ***Common Rock-sparrow*** *differs from the* Gymnoris *bush-sparrows in its longer wings, its short, square tail with white terminal spots, and its heavy, conical bill. In contrast to the more arboreal* Gymnoris *species, it is generally found in bare, treeless country. Where the species in this group overlap in distribution, they tend to be separated by preferences for drier or more humid habitat.*

[*Petronia petronia petronia*, Lesvos, Greece. Photo: Mathias Schäf]





Larger and more finch-like than the other members of Passeridae, the snowfinches are more conspicuously patterned, have proportionately much longer wings and legs, and generally run rather than hop. The three Montifringilla *snowfinches remain at high altitudes throughout the year. They are mainly found in Asia, although the* ***White-winged Snowfinch*** *is found above the tree-line across southern Europe as far west as the Pyrenees. Snowfinches measure slightly longer than the rest of the Passeridae, at about 17 cm, but can be considerably heavier, at up to 57 g, as compared to 17–40 g for the rest of the family. The breeding male (above) of the nominate race of the White-winged Snowfinch has a bluish-grey head, separated from the black chin and throat by a short pale stripe, and rich chocolate brown upperparts. The non-breeding male (below) is much duller, with a brownish-grey head. The bill not only changes colour, from black in the breeding bird to horn-coloured, but, as can be seen here, is also longer in the summer, when insects are an important part of the diet. This seasonal change in bill length is characteristic of all members of Passeridae that have been studied. The longer wings of the snowfinches reflect the more aerial habits of these species, which include display-flights, and catching insects in flight.*

[Above: *Montifringilla nivalis nivalis*, Bern, Switzerland. Photo: Rolf Kunz.

Below: *Montifringilla nivalis nivalis*, Huesca, Spain. Photo: Javier Ara Cajal]

This has led some authorities, particularly A. Gebauer and his co-workers, to separate *Montifringilla* into two, or even three, distinct genera: the three snowfinches proper, which are increasingly being referred to as "snow-sparrows", are retained in *Montifringilla*, with the ground-sparrows, sometimes called "mountain steppe-sparrows", divided into the genera *Pyrgilauda* and *Onychostruthus*. The differences between the last two genera are somewhat marginal, and it would seem better to treat *Onychostruthus* as a synonym of *Pyrgilauda* pending further study.

The snowfinches are social species, breeding in small loose colonies in crevices in rocks, whereas the ground-sparrows are highly territorial, breeding in the abandoned burrows of rodent colonies or even in burrows that they have themselves excavated, using the bill and feet. The association of the latter with rodents is so close that it has even been suggested that they could be hosts of the bubonic plague bacterium (*Pasteurella pestes*), which is endemic within their geographical range. These burrows are used not only for nesting, but also for roosting, for shelter from the elements, and to escape from predators. Characteristic of many passerines living in open country, both the snowfinches and the ground-sparrows have songs that are a component of elaborate display-flights, as well as being given from a conspicuous perch, the latter particularly in the case of the snowfinches, which occur in rocky country, compared with the more steppe-like high plateaux inhabited by the ground-sparrows. The ground-sparrows not only forage on the ground, but also dig into the earth, and the dung of large mammals, in order to obtain invertebrate food. The snowfinches are considerably more aerial than the ground-sparrows, even to the extent of catching insects in flight.

The three snowfinches in the genus *Montifringilla* were once considered to represent a single species, or, alternatively, the Tibetan Snowfinch (*Montifringilla henrici*) was treated as a subspecies of the far more widespread White-winged Snowfinch or of the Black-winged Snowfinch (*Montifringilla adamsi*). It is, however, now recognized as being sufficiently distinct from the former to merit treatment as a full species, the more so as it overlaps in range with the latter, evidently without interbreeding, in a few areas. The three species are thought to form a superspecies.

V. V. Ivanitskiy suggested, in 1997, that some Passeridae had spread to the steppes of Asia in the Miocene, 25–5 million years ago, and in the orogeny of the later Tertiary separated into three genera. *Pyrgilauda* adapted to high-altitude steppe, and *Montifringilla* to high rocky mountain country, whereas *Petronia*, presumably including *Carpospiza* and *Gymnoris*, remained in lowland steppe and subsequently spread westwards, the bush-sparrows subsequently recolonizing Africa. The distribution of the snowfinches and ground-sparrows matches that of the accentors, which Sibley and Ahlquist, interestingly, considered to be more closely related to the ploceid weavers than to the genera *Passer* and *Petronia*.

Pending the resolution of where the Old World sparrows belong in relation to the other major seed-eating songbirds, the currently preferred arrangement is to treat them as a distinct family, Passeridae, with six genera. *Passer*, including the defunct *Auripasser* and *Sorella*, contains the true sparrows, a total of 26 species. *Carpospiza* is a monotypic genus, containing the Pale Rock-sparrow, while *Petronia*, another monotypic genus, houses the Common Rock-sparrow. *Gymnoris* contains four species of bush-sparrow, sometimes referred to as petronias; *Montifringilla*, the "typical" snowfinches, comprises three species; and, finally, *Pyrgilauda*, the ground-sparrows, consists of five species.

As already noted, there have been several recent taxonomic "splits", whereby taxa which were treated as subspecies are now considered to merit full species rank. In the Afrotropics, the five species forming the grey-headed sparrow superspecies were previously treated as conspecific, under the name *P. griseus*, and this is still preferred by some authorities. Similarly, the six species constituting the rufous sparrow superspecies have generally been combined in a single species under the name *P. motitensis*, and, again, some authorities maintain the latter arrangement.

Several other potential splits are worthy of consideration. For example, the eastern subspecies *yatii* of the Dead Sea Sparrow (*Passer moabiticus*) is a well-marked form, sometimes referred to as the "Afghan Scrub Sparrow" or "Yates's Sparrow". It has a small range, confined to the border regions of Iran, Afghanistan and Pakistan, is distinctive in morphology and plumage, and is geographically remote from other populations of the Dead Sea Sparrow. This eastern race was originally described as a separate species, but was subsequently merged with the western populations of the Dead Sea Sparrow. Whether *yatii* really does represent a separate species is undecided, but the possibility certainly merits investigation.

Another example concerns the Socotra Sparrow (*Passer insularis*), one of the six species forming the rufous sparrow superspecies. This species is presently treated as containing two subspecies, the nominate race on the main island of Socotra and the race *hemileucus*, found on the small 'Abd al Kuri, to the west; individuals of this species on the islets of Samha and Darsa, between the two, have been included within the nominate race. Recent studies indicate, however, that *hemileucus* may represent a full species, the "Abdelkuri Sparrow", much paler than the





The ground-sparrows (Pyrgilauda) *differ from snowfinches* (Montifringilla) *in occupying alpine steppe rather than rocky habitats, and in descending to lower levels in the winter. Three of the five species, including the* ***Rufous-necked Ground-sparrow****, are colourful and distinctively patterned. They nest in the abandoned burrows of small rodents, though at least one species, the less colourful* ***White-rumped Ground-sparrow****, can use its bill and large, strong feet to dig its own burrow.*

[Left: *Pyrgilauda ruficollis*, China.
Photo: Zhang Ming.

Right: *Pyrgilauda taczanowskii*, China.
Photo: Dong Lei]



*Most sparrow species are gregarious. Even those that are not social breeders gather in flocks for foraging outside the breeding season. Autumn flocks of **Eurasian Tree Sparrows** can include hundreds or even thousands of birds, which gather to feed on fields of grain. In late autumn these flocks may break up, the adults returning to their breeding areas, while the young disperse in search of breeding colonies to join. While some species may forage with congeners and other seed-eating birds, most sparrows gather in large, single-species roosts, in trees, reedbeds and other sheltered sites.*

[*Passer montanus saturatus*, Wusulin, Tainan, Taiwan. Photo: Jao-Shong Fan]

Socotran taxon and sufficiently divergent genetically to warrant such treatment. Further, it has even been suggested that the population on the small islet of Samha might be an additional, small subspecies of the Socotra Sparrow. Clearly, more research on these poorly known sparrow populations is required.

Finally, the Italian Sparrow, already commented upon, presents one of the most intriguing subjects of taxonomic debate. It is worth bearing in mind that it is often considered to be no more than a hybrid form between the House Sparrow and the Spanish Sparrow, although many taxonomists have treated it as a subspecies of one or the other of those two species. Others consider the Italian Sparrow to be sufficiently different from both of them to be accorded the rank of a full species. Although the current view is that it does warrant recognition as a discrete species, opinions differ over whether it is a stabilized hybrid between the House and Spanish Sparrows or whether it evolved independently in north Africa and subsequently spread northwards to Italy, becoming extinct in the north African area of its origin. The latter view is put forward on the grounds that speciation in animals can occur only through geographical isolation, and not by hybridization. Nevertheless, the principle of economy suggests that the hybridization hypothesis is the more plausible, providing the example that "proves the rule". While the origin of the Italian Sparrow remains uncertain, it is most conveniently treated, as is now common practice, as a distinct species on the grounds that the population is now stable, having resulted from events long past.

*Species that breed in colonies are often strongly territorial in the immediate vicinity of the nest. The male **Tibetan Snowfinch**, for example, uses the large white patch on its wing to signal its ownership, both in display-flights and while perched on the ground. These snowfinches begin defending their territories as early as April, though do not begin breeding until June.*

[*Montifringilla henrici*, Qinghai, China. Photo: Axel Gebauer]

Morphological Aspects

The Passeridae are granivores, seed-eaters. Granivory depends on removal of the hard tegument, or testa, from the seed. This requires special structures in the horny palate, the tongue and the lower mandible, with the associated musculature, to manipulate the seed, remove and dispose of the husk, and gain access to the nutrient kernel. In addition, there are associated specialized developments in the alimentary canal for digesting the seed. Granivory has evolved in a number of passerine families, and these families are separated mainly on the basis of differences in the internal structures developed to deal with this food source. The alimentary tract of the Desert Sparrow (*Passer simplex*) is much shorter than that of the other *Passer* sparrows, suggesting that this species takes a proportionately higher amount of insect food than do its congeners.

Old World sparrows differ from the other granivorous passerine families in the possession of a unique skeletal structure in the tongue, the preglossale, which acts to stiffen it. The sparrow holds the seed transversely in the bill and dehusks it by crushing it with the tongue against the horny palate. The Passeridae have a thick, conically shaped bill which tapers to a point; the large nostrils are partly covered by short rictal bristles and also by the







Fighting sparrows cling to one another with their claws while pecking at each other's heads. Such fights can continue until both birds are lying exhausted on the ground. Sparrows are aggressive to one another around the nest, when foraging, and even in defence of the hollows they create while dust-bathing. Females are more aggressive than males, and are particularly aggressive towards their mates at the nest. It has been suggested that much of the quarrelsome behaviour between males is a release mechanism, the result of suppressing aggressive responses to the female in order to maintain the pair-bond. Threat displays by males are similar to courtship displays, though with feathers sleeked rather than ruffled, and without the wing shivering. When threatening, males face their rivals directly, and may stretch their heads upwards and forwards, exposing the bib. The ***Desert Sparrow*** *is a relatively large-bibbed species, the bib extending from the chin to the upper breast. Among the males of the black-bibbed* Passer *sparrows, bib size has been found to be an indicator of status: males with large bibs tend to be dominant. They are less aggressive towards, and receive less aggression from, other males. However, they are more likely to be the targets of aggression from females. One theory is that females are testing whether the male is as tough as his bib suggests he is.*

[*Passer simplex saharae*, Tunisia.
Photos: Jesús Rodríguez-Osorio]



Preening sparrows scratch their heads by the "indirect" method, bringing a leg up over the folded wing, as this ***Southern Rufous Sparrow*** *is demonstrating. Another form of comfort behaviour associated with keeping clean is bill-wiping. A number of sparrow species have been observed to wipe their bills frequently. Sometimes this follows eating messy food, such as over-ripe berries, but it also seems to function as a displacement activity during or after stressful situations. Male House Sparrows* (Passer domesticus)*, for example, bill-wipe between successive treadings of the female while copulating. Birds may go through the motions of wiping the bill without actually touching a surface.*

[*Passer motitensis*, Kamajab, Namibia. Photo: Peter Ryan]

feathers of the forehead. The bill is most robust and blunt in the rock-sparrows and bush-sparrows, tapering more to a fine point in the snowfinches and ground-sparrows. The Passeridae tend to exploit the medium-sized seeds of grasses and small herbs, in general preferring smaller seeds than those taken by the buntings and allies. The true sparrows, those in the genus *Passer*, specialize particularly on the cereal grains developed by man from large-seeded wild grasses; the rock-sparrows show this preference to a lesser degree, but the snowfinches and ground-sparrows that inhabit high altitudes, above the limits of cultivation, barely specialize on such seeds at all. The bill of those species that have been studied in detail is longer in the summer than in the winter, reflecting the variation in diet throughout the year, from softer invertebrates in summer to harder seeds in winter.

This is a comparatively small family, with relatively little difference in size among the 40 species. They range in length from 12 cm to 17·5 cm and in weight generally from 17 g to 40 g, and are thus relatively small birds. The one exception to this is the White-winged Snowfinch, which, although comparable in length, has been recorded as weighing up to 57 g. Females tend to be smaller than males, but there is considerable overlap in size between the sexes.

Structurally, the Passeridae have broad, somewhat blunt wings, which are rather short in the case of the true sparrows. They have ten primaries, but the tenth, outermost, one is much reduced in length and is rotated dorsally, so that it lies under the ninth primary and is obscured by the coverts; in this respect they resemble the Fringillidae, a family in which they were formerly placed. The wing lengths of the snowfinches and ground-sparrows, which are strong fliers and have extensive aerial displays, are proportionately much greater, on average 65% of the overall length; this is relatively long even when compared with the migratory race *bactrianus* of the House Sparrow and the Spanish Sparrows of the race *transcaspicus*, which migrate over the Tien Shan to winter quarters in northern Pakistan and India. The rock-sparrows and bush-sparrows are intermediate, with wing length 60% of the total length, although an exception is provided by the Pale Rock-sparrow, which has a wing length similar to that of the snowfinches and ground-sparrows and, like them, has an elaborate display-flight; it is migratory. The tail is relatively short, characteristically so on the Common Rock-sparrow, and has twelve rectrices.

The legs of the true sparrows, rock-sparrows and bush-sparrows are short, and the tarsus is covered with large scutes at the front. Those of the snowfinches and ground-sparrows are stronger, these being species that run quickly and use the feet for digging for food and for removing soil from the burrows in which they breed.

Whereas, in the case of the rock-sparrows, bush-sparrows, snowfinches and ground-sparrows, the sexes are alike or closely similar, the *Passer* sparrows exhibit two distinct groups in respect of sexual dimorphism. One consists of the monomorphic grey-headed sparrows and the fairly uniform golden sparrows and Chestnut Sparrow, and the other contains the remainder of the genus, in which the male has a well-patterned head and a black bib and the female lacks these characters. The males of the black-bibbed *Passer* species generally show chestnut or tawny-brown on the head, contrasting with the crown and the paler grey or yellowish cheeks; the chestnut colour also appears frequently in the nape and wings. On most species the back is heavily streaked, although this streaking is lacking on the Pegu Sparrow (*Passer flaveolus*), giving rise to its rather prosaic alternative vernacular name of "Plain-backed Sparrow". The rock-sparrows and bush-sparrows are distinguished by the presence of a yellow spot on the throat, although this is inconspicuous on some species and is difficult to see in the field; moreover, it is lacking on one, the rather different and anomalous Pale Rock-sparrow. In contrast to the rather muted colours of the last group, the snowfinches and ground-sparrows are conspicuously plumaged, most species exhibiting varying amounts of white, particularly in flight and, especially, during the display-flights, and many of the males having a small black chin patch.

Plumage abnormalities are not uncommon in this family, primarily among the *Passer* sparrows. Partial replacement of up to 50% of the male's black bib feathers by chestnut ones is fairly frequent, occurring in about 3·5% of individuals. Albinism, both partial and complete, is slightly less common, although it affects 1–2% of the birds. Melanism is found in about 0·2%. Not to be confused with melanism, a darkening of the plumage by soiling is quite common in built-up areas, particularly industrial ones, but more confusing is the appearance of sparrows with a bright yellow head; this is the result of contamination by pollen acquired when the birds are searching the flowerheads for insects. Two House Sparrows with rosy-red plumage were seen in August 2004 in Glenbervie, in Scotland. This was not, however, an example of



Sparrows bathe by standing in water and using their wings to flick water over themselves, while ducking their heads under the surface. In urban areas, ***House Sparrows*** *will bathe in puddles in the street. Bathing is a social activity, and is always followed by preening. Afterwards, the birds may gather in a sheltered place to rest, and indulge in social singing—a conversational babble including softer versions of their social contact calls, in which the whole flock joins. Something similar is heard at communal roosts, where it is less conversational-sounding, and interspersed with threat and alarm calls, as the birds quarrel over favoured perches.*

[*Passer domesticus domesticus*, Öland, Sweden. Photo: Markus Varesvuo]

erythrism, which is very rare in sparrows, but was thought to have been the result of the birds feeding on a food prepared for farmed salmon (*Salmo*), and which was based on ground prawns (Dendrobranchiata), during the period of feather growth after the moult. It certainly is the case that birds in aviaries have been coloured in this way by being fed with special diets containing, for example, paprika and Cayenne pepper, a product of the seeds of *Capsicum*, at the time of the growth of new feathers.

The young of this family are born naked, without natal down. They undergo a complete post-juvenile moult, beginning 1–3 months after fledging, when they become almost indistinguishable in the field from the adults. The adults have a single annual post-breeding moult. For the temperate populations this starts after the rearing of the last brood, and lasts for about 60–70 days. In the tropical and subtropical populations, however, there may be some overlap in the timing of the of moult and breeding, or the moult may be discontinuous, starting during interruptions of breeding, such as for House Sparrows in India during the monsoon, and in these cases it can last for up to 130–150 days. The freshly moulted plumage tends to be somewhat paler than that of the breeding adult, the full breeding plumage being exposed as the pale feather tips are abraded. This is particularly so with the black-bibbed sparrows, the bib increasing both in size and in intensity of blackness as the male comes into breeding condition. Abrasion of the feathers is, of course, one of the reasons for the need to replace them periodically. The appearance of Cape Verde Sparrows (*Passer iagoensis*) nesting in holes in lava cliffs suggests that the parents sustain so much wear through brushing against the rough lava that there is a danger that, by the end of the breeding season, their flying ability will be seriously impaired and a set of replacement feathers is badly needed.

A feature of many species in the family is a seasonal change in the colour of the bill, which is pale brown or horn in the non-breeding season, becoming black on the sexually active male. This is particularly characteristic of the black-bibbed true sparrows, but it occurs also among the monomorphic species. In some, such as the African grey-headed sparrows, it remains black throughout the year in both of the sexes. A similar seasonal colour change is apparent in both sexes for most of the snowfinches and ground-sparrows, but this phenomenon is less marked in the rock-sparrows, most of which retain a horn-coloured bill throughout the year.

The gait of the true sparrows, the rock-sparrows and the bush-sparrows is a hop, although the grey-headed sparrows occasionally walk. Walking and even running are more common methods of locomotion among the snowfinches and ground-sparrows and in the Pale Rock-sparrow, species that live in open, treeless country.

Habitat

It is likely that the family originated in a semi-arid to arid grassland with scattered trees, where the seed-eating habit evolved, although there has been considerable radiation from this habitat. It is still the typical habitat for many of the true sparrows, such as the superspecies based around the Southern Rufous Sparrow (*Passer motitensis*), the rock-sparrows, and the snowfinches and ground-sparrows. Some species, however, have moved into desert or semi-desert, examples being the Desert Sparrow, the Saxaul Sparrow (*Passer ammodendri*) and the two golden sparrows, while others have adopted much more humid areas, as illustrated by, for example, the grey-headed sparrows in Africa and the Spanish Sparrow and Sind Sparrow (*Passer pyrrhonotus*) in the Northern Hemisphere. Some have even penetrated light woodland, as evidenced by the bush-sparrows and the Eurasian Tree Sparrow, but none has become a true woodland species.

The snowfinches and the closely related ground-sparrows are very much birds of high altitudes, the former associated with rocky country and settlements high in the mountains, remaining close to the snow-line throughout the year. The ground-sparrows are associated more with mountain-steppe country, frequently descending to lower altitudes in the winter. The Afghan (*Pyrgilauda theresae*) and Blanford's Ground-sparrows (*Pyrgilauda blanfordi*) occur in dry arid areas, but do not overlap in range. The other three ground-sparrows are found more commonly in damper areas. The Small Ground-sparrow (*Pyrgilauda davidiana*) lives usually close to water on the edges of marshes in semi-desert and rocky plains, and is generally separated by distribution from the Rufous-necked Ground-sparrow (*Pyrgilauda ruficollis*), which is found near small watercourses, and the White-rumped Ground-sparrow (*Pyrgilauda taczanowskii*), which occurs in the drier parts of marshy areas.

Probably the most significant feature of habitat use by this family has been the development of a close association with man,



Sparrows are among the few passerine families which indulge in dust-bathing, as well as bathing in water; the former would presumably have originated in habitats where standing water was scarce. Like water-bathing, it is a social activity, and flocks of over 100 ***Spanish Sparrows*** *have been reported dust-bathing together. The sparrows first scoop out a small depression in dry soil or sand by scratching with the feet and bill. These hollows, which pit the ground in suitable places, are defended vigorously. In a manner similar to water-bathing, dust-bathing involves flicking movements of the wings, to throw dust particles over the feathers. Members of this family use the same motions to bathe in wet or powdery snow.*

[*Passer hispaniolensis hispaniolensis*, Lesvos, Greece. Photo: Gary Thoburn]

initially through feeding in cultivated land on cereal crops, especially where there are hedgerows or trees in which the birds can take cover, and ultimately extending into habitations and built-up areas. This is particularly the case with the true sparrows in the genus *Passer*, no fewer than 17 of the 26 species of which nest on man's buildings, two of them, the House Sparrow and Eurasian Tree Sparrow, becoming predominantly inhabitants of villages and towns; other species use buildings, as well as areas away from man. House Sparrows tend to be the dominant urban species, although the situation becomes less clear-cut in the east of its range. For example, this species and the Eurasian Tree Sparrow nest side by side in the built-up environment in Siberia, Mongolia and Assam, whereas in Afghanistan there is a complete role reversal, with the Eurasian Tree Sparrow in the towns and the House Sparrow only in open, uninhabited country. One other place in which the House Sparrow is not completely dominant in an urban area is Mindelo, on San Vicente, in the Cape Verde Islands, where the indigenous Cape Verde Sparrow is as much at home as the introduced House Sparrow in the centre of the town.

Where House Sparrows are lacking, as, for example, on Sardinia, the Eurasian Tree Sparrow, a recent colonist, is dominant over the Spanish Sparrow as a breeding species in the towns, although in areas where both the House and the Eurasian Tree Sparrows are absent, as, for instance, on Madeira and in the Canary Islands, the Spanish Sparrow moves freely into the towns. The Spanish Sparrow also becomes a village bird in those Saharan oases in which there are no House Sparrows. On the Italian mainland, Italian Sparrows and Eurasian Tree Sparrows share the urban habitat. Similar relationships exist between the House Sparrow and the Russet Sparrow (*Passer rutilans*) in the Himalayas and between the Eurasian Tree Sparrow and the Pegu Sparrow in Thailand, where the House and Eurasian Tree Sparrows are respectively the dominant urban species, with the other relegated to the more open areas on the outskirts.

Away from built-up areas, there is a fairly clear habitat separation. For example, the Spanish, Dead Sea and Sind Sparrows tend to occur in moister areas than those frequented by the more aridity-loving House Sparrow. Again, the African grey-headed sparrows prefer more humid areas than those inhabited by the rufous sparrows, although even within the grey-headed sparrow superspecies there is some separation in the small areas of overlap, with the Parrot-billed Sparrow (*Passer gongonensis*), for example, found in more arid country than Swainson's Sparrow (*Passer swainsonii*).

Less overlap in distribution occurs between species in the rock-sparrow and bush-sparrow complex, but where it does occur there is, again, a separation into the drier areas and the more humid ones. The Pale Rock-sparrow is found in more arid country compared with the Common Rock-sparrow, and the Russet-browed Bush-sparrow (*Gymnoris dentata*) in more arid country than that occupied by the Yellow-spotted Bush-sparrow (*Gymnoris pyrgita*).

Some members of the family have very specific requirements for nesting and roosting. The Dead Sea Sparrow prefers

Many of the calls of the genus Passer *are variants of the basic disyllabic "chirp", and their songs consist of similar notes strung together. The* ***Pale Rock-sparrow*** *is unlike the rest of the family in having a song that recalls those of finches (Fringillidae), consisting of a monotonous, insect-like buzzing, reminiscent of the "wheeze" of a European Greenfinch* (Carduelis chloris). *The song may be given from the top of a rock or bush, although early in the breeding season, unpaired males fly from one songpost to another in a display-flight that may include singing.*

[*Carpospiza brachydactyla*, Isikli, Gaziantep, Turkey. Photo: Emin Yogurtcuoglu]





Snowfinches (Montifringilla) *and ground-sparrows* (Pyrgilauda) *have more elaborate songs than other members of the family. The song of the* ***Black-winged Snowfinch*** *is a distinctive single note repeated rather monotonously from the top of a rock or during a display-flight. Although similar in appearance to the point that they were once considered conspecific, the White-winged Snowfinch* (M. nivalis) *has a very different song, a complex mix of varied buzzy chirps and other calls, with much repetition of individual elements. The flocks of Black-winged Snowfinches which form after breeding keep up a constant soft twittering.*

[*Montifringilla adamsi xerophila*, Tsaring Nor, China. Photo: Axel Gebauer]

dead trees standing in water, the Sind Sparrow seeks trees and bushes beside rivers and marshes, and the ground-sparrows require areas with numerous small-mammal burrows, but most are very adaptable and will use a wide variety of sites. House Sparrows prefer holes for nesting, but in new housing estates with little availability of holes they readily accept thick conifer hedges. The ground-sparrows utilize the burrows of small rodents not only for nesting, but also for roosting and for escaping from predators, each species tending to specialize on a particular mammal.

The extent to which the House Sparrow has exploited the habitat created by man is quite extraordinary. In tropical Latin America, where it has been introduced, it forages on the ground in the early hours, avoiding the heat of the day by resorting to the shade trees that are a feature of the plazas in the towns. At the other extreme, it has been able to spread north of the Arctic Circle in Norway, surviving the cold and continuous dark by moving into the cattle byres, where there was heat, light and food. The act of moving into buildings is not limited to extreme conditions. For example, those introduced in Queensland, in north-east Australia, spend most of the day inside farm buildings, rather than in the open, and could easily be overlooked. House Sparrows also come into covered rail stations, a fact celebrated in Joan Pomfret's poem *Railway Sparrows*:

> "... underneath the station's high arched dome
> A dozen happy sparrows make their home!
> Perhaps they like the bustle and the din.
> The sooty railway air to flutter in –
> The shining rails, the steam, the distant drums,
> The picking of the rail-bar's scattered crumbs,
> And engine smoke ascending, dense and blue,
> The clatter as the Royal Scot comes through."

Further, they readily enter large industrial buildings with easy access, which provide shelter and spilt food scraps from the luncheon packets brought in by the workers. The latest development is that they have learnt how to open the electrically operated doors by interrupting the electronic beam that acts as a switch. This is not just an isolated occurrence, either, as it has been reported from at least four widely separated areas in the last 20 years: from Melbourne and Wagga Wagga, in Australia, from Hamilton, in New Zealand, and from Nantes, in western France. Both House and Eurasian Tree Sparrows have utilized the artificial lighting at airports and other public buildings to enable them to continue feeding their nestlings throughout the night, exploiting the insects attracted to the lights.

The Common Rock-sparrow, too, exhibits some association with humans, coming into the edges of habitations and nesting on buildings. Even the high-altitude snowfinches and ground-sparrows make use of inhabited areas in which to feed, the White-winged Snowfinch particularly at winter ski resorts, where it picks up scraps of food discarded by visitors, and Blanford's and the Rufous-necked Ground-sparrows at rubbish dumps on the edges of villages.



The Passeridae are essentially seed-eaters, specializing in the seeds of grasses, including cultivated cereal crops, and small herbs. Deviations from this basic diet reflect food availability. The ***Yellow-spotted Bush-sparrow****, found in a variety of dry, open habitats with trees, eats the berries of the salt-tolerant toothbrush tree* (Salvadora persica). *Like other members of the family, it forages on the ground, but* Gymnoris *bush-sparrows spend much time in trees, where they search for insects in the manner of tits (Paridae).*

[*Gymnoris pyrgita pyrgita*, Ishaqbini, Tana River, Kenya. Photo: Roland Seitre]



Cultivated grain can make up as much as 75% of the diet of the House (Passer domesticus) *and* ***Spanish Sparrows****, with oats and wheat predominant, and barley, millet, rice and other cereals featuring less regularly. Seeds are taken both from the ripening plants, and from the ground where they have fallen or been spilt. The birds use their weight to pull the heads of taller grasses and cereals down to the ground, where they can be dealt with more easily.*

[*Passer hispaniolensis hispaniolensis*, Lesvos, Greece. Photo: Mathias Schäf]

General Habits

The Passeridae are predominantly gregarious, many species breeding in loose colonies (see Breeding), and even those that are not social breeders gather in flocks for foraging outside the breeding season and form large social roosts. Only one species, the Southern Rufous Sparrow of southern Africa, is by habit a solitary nester, and even outside the breeding season it is seldom seen in anything more than family parties.

Social behaviour is most pronounced outside the breeding season, when large flocks are formed. These forage for seeds on the ground, often not only with congeners but also with other seed-eaters, such as buntings and finches. Unlike the latter groups, the sparrows preferentially forage close to cover, such as bushes and hedges, into which they can flee for protection against predators. Seed-eaters alternate periods of feeding with periods of resting as the seeds are digested. A special feature of the sparrows is a tendency to collect in cover when they are not foraging and to indulge in "social singing", which is characterized by soft conversational chirruping incorporating quiet versions of the social contact and mildly aggressive calls. It is a frequent habit of House Sparrows even in the short winter days of the temperate regions, a fact that suggests that the birds are not having too much difficulty in finding food. This same behaviour has been noted for a number of the species and may be quite widespread, involving some of the less well-studied members of the family.

In contrast to the mixed-species feeding flocks, the sparrows form predominantly single-species roosting associations. These roosts can be very large, often involving many thousands of individuals. For example, R. E. Moreau reported a post-breeding roost in Egypt that contained about 10,000 House Sparrows. In the Mediterranean region, the Spanish Sparrow comes into inhabited areas to roost in the thick shade trees that are present in many of the town squares. These roosts can be very conspicuous, the birds wheeling around in flight before they settle. The numbers of sparrows can be large and can represent a considerable nuisance. For example, in the town of San Antioco, on Sardinia, a roost in the shade trees in the Corso Vittoria Emanuel was estimated to contain several tens of thousands of individuals. This street was closed to traffic at night, and had to be cleaned with mechanical roadsweepers before it could be opened again to traffic in the morning.

For the purposes of roosting, the sparrows use well-covered sites, such as thick bushes and trees, palm crowns, creepers and reedbeds. Although very gregarious, the passerids are not typically close-contact birds, mated partners maintaining their individual distance. The one exception is the Eurasian Tree Sparrow, presumed mated pairs of which can be seen snuggled up one against the other.

The bush-sparrows, while still foraging on the ground for food, spend even more time in the trees, not only for resting, but also for much of their food-gathering. The snowfinches and ground-sparrows are typically ground birds, inhabiting open areas where trees and bushes are absent. They nest in rock crevices or in the holes of small mammals in the ground, some species even spending a lot of time out of sight in the holes, where they



Several species of sparrow will feed on nectar when available, and as with this ***Chestnut-shouldered Bush-sparrow****, their foreheads may acquire a golden dusting of pollen. This can also happen when sparrows are searching flower heads for insects. Having fed on nectar, this bird is now eating small berries. However, despite its comparatively long and slender bill, this species is primarily a seed-eater. Unlike the other three* Gymnoris *species, it spends more time foraging on the ground than in trees.*

[*Gymnoris xanthocollis*, Oman. Photo: Markus Varesvuo]

roost, shelter and take refuge against predators. They use their long bills and strong feet for removing loose soil from the burrows, and one species, the White-rumped Ground-sparrow, is even capable of digging its own burrow.

As the Passeridae are essentially ground birds, the typical gait of all of the species is that of hopping. Nevertheless, walking is utilized frequently by at least one true sparrow, the Southern Grey-headed Sparrow (*Passer diffusus*), and is common for the snowfinches, the ground-sparrows and the Pale Rock-sparrow, which are much more birds of open country with behaviour approaching that of the larks. Many of the *Passer* sparrows, however, when searching for seeds and insects, also indulge in acrobatic behaviour in trees in the manner of tits (Paridae). Some species that live in close association with humans have put this acrobatic facility to good use by hanging on to wire peanut feeders, copying tits and such finches as the European Greenfinch (*Chloris chloris*) and Eurasian Siskin (*Carduelis spinus*), which are particularly well adapted to this feeding technique.

This family is one of the few passerine families that indulges in dust-bathing. Such behaviour is indicative of an origin in an arid habitat, and is one characteristic that differentiates the Old World sparrows from the weavers. In order to dust, the sparrows first scoop out a small depression in dry soil or sand by scratching with the foot and bill-flicking. They are unusual also in that they bathe in water, as well as dusting. The "stand-in" method of water-bathing is used, with a wing-flicking action similar to that employed in dusting. The only other passerine family with the combination of dusting and stand-in bathing is the completely unrelated wrens (Troglodytidae). The passerids perform the same wing action also in both dry and melting snow, which can be interpreted as a combination of dusting and bathing.

Both dusting and bathing are social activities. Up to 20 or more House Sparrows can be seen dusting together, and in favoured places the ground becomes pockmarked with dusting hollows that are vigorously defended against rivals. Both of these maintenance activities are regularly followed by sunning. In this, the bird lies flat in a secure place, as, for example, on a roof, with the wings spread and the body feathers fluffed out, allowing the sun's rays to penetrate. Preening is also regular. During head-scratching the indirect method is used, the bird bringing a leg up over the folded wing.

While not necessarily a family characteristic, one feature of the House Sparrow's behaviour has attracted much attention and therefore deserves special mention. This is the habit of flower-tearing in the spring, yellow flowers being particularly affected. No completely satisfactory explanation of the behaviour has been put forward, leading to its having been described as being purposeless and mischievous. This seems inherently improbable, and it appears more likely that, even if the petals appear to be merely torn and scattered, the sparrows are also obtaining some sustenance. It may be relevant that the behaviour is more frequent in dry springs with little rainfall.

Voice

The chirping call of the House Sparrow is so characteristic of the more familiar members of the genus *Passer* that the epithet "sparrow-like" is frequently used in descriptions of the calls of other passerine species. The main call of the House Sparrow is a basic monosyllabic "chirp" or disyllabic "chirrup", which has given the bird the colloquial name of "Philip Sparrow": in the words of one author, "all sparrows are called Philip, 'phip phip' they cry". This call, with variants, is common to all members of the genus *Passer*. It is the primary call used in contact situations with conspecifics and at the nest. The females use a similar, though softer version. Again, in appeasement contacts between partners and between the pair and its young, the harsh chirp is transformed into a soft "chee", "quee" or "dee", which is used as an invitation to coition or by the young in begging for food. An even softer version of this same call is used as a greeting at the nest by members of a pair.

A further circumstance in which the basic chirping call is prominent is what is best described as "social singing". This occurs when a group of sparrows is resting together in cover, with the notes much softer and more conversational in character than the similar calls used in advertising situations. The conversational nature of social song is illustrated also by the way in which the whole sound ebbs and flows as different numbers of individuals join in.

The basic chirp is used by the male to proclaim ownership of a nest, and the notes can be strung together as a series to form a rudimentary song, which is used by the unmated male to attract a mate. In the case of the highly social Spanish Sparrow, this song can be represented as a strident, repeated "chweeng-chweeng" or "cheela-cheela" uttered in pairs, higher-pitched and louder than that of the House Sparrow, to the extent that it can be heard at a



*Found in truly arid areas, the **Desert Sparrow** obtains most, if not all, of its water requirements from its food. This species feeds on the "acheb" flora, short-lived grasses, mustards (Cruciferae) and other vegetation that springs up after seasonal rain. Its primary food is the seeds of permanent grasses and other ground vegetation. It seems to eat a higher proportion of animal (insect) food than its congeners, and its alimentary tract is shorter than that of any other member of the family.*

[*Passer simplex saharae*, Tunisia.
Photo: Jesús Rodríguez-Osorio]



In the high-altitude steppe, and the rocky slopes between the tree-line and the snow-line, where the ***Tibetan Snowfinch*** *lives, the seeds of grasses can be in short supply. Little is known about the feeding choices of this species, but studies of its congener, the White-winged Snowfinch* (Montifringilla nivalis)*, in Switzerland, suggest that it actually prefers the seeds of alpine plants to those of grasses growing at lower altitudes. As well as foraging on the ground, the three species in this genus also catch insects in flight. Their remoteness from settlements means they are less associated with humans than the* Passer *sparrows. But with the spread of ski resorts in Europe, the White-winged Snowfinch is commonly seen scavenging for food scraps in the winter.*

[*Montifringilla henrici*, Qinghai, China. Photo: Axel Gebauer]

distance of several hundred metres. Similarly, the basic "chitta" call of the Sudan Golden Sparrow is repeated urgently by the male at the nest, creating a tremendous din in a large colony. Once again, the same applies to the "chip-chip-chip" or "chip-chip-chizza" calling of the Dead Sea Sparrow. All these calling situations are associated with conspicuous wing-shivering. Similar songs and behaviour, although perhaps less noisy and striking, are a characteristic of most, if not all, species in the genus *Passer*.

As is to be expected with highly social species that form flocks outside the breeding season, if not actually breeding colonially, the true sparrows have an extensive range of vocalizations that are used in interactive situations. A further range of calls has a more nasal "quer" sound. There is a gradual transition from this call, which can be given as a single or repeated series of notes or variants such as a nasal "quer-tit", "ki-quer" or "ki-quer-tit" that are used in alarm, to a harsher and more guttural trilled "churr", used as a threat against conspecifics or other intruders at the nest. The alarm calls also serve a social function, alerting other members of a flock, and even different species in a mixed flock, to danger. The Eurasian Tree Sparrow is even said not to call in



Insects and other animal foods can make up to 10% of the diet of ***House Sparrows*** *in the summer. The bills of this and other species are longer in summer than winter, reflecting this change to softer food. House Sparrows forage for arthropods on the ground, but also catch butterflies in flight, and will take dragonflies when these are resting in a semi-torpid state in the cool of the morning. Adaptable and opportunistic, House Sparrows exploit the moths and craneflies attracted to bright lights at night, and pick the bodies of dead insects from the radiators of cars. They will also eat molluscs, small frogs, and in coastal areas, small crustaceans.*

[*Passer domesticus domesticus*, Bulgaria. Photo: Konrad Wothe]

such situations, relying on the calls of other species to give warning of danger.

The Common Rock-sparrow has an even greater range of vocal utterances, generally similar in character to those of the true sparrows and even more varied, although the significance of the different calls and the situations in which they are used have not been studied in detail. The bush-sparrows have a more melodious song, which they deliver from a perch in a tree; their calls are said to be generally similar to those of *Passer* sparrows. In contrast, the Pale Rock-sparrow, again emphasizing its anomalous position, has quite a different, rather finch-like song that is given from a prominent perch on a rock or the top of a bush, the sexes at times duetting. Its calls are more akin to those of *Passer*, but have not been described in detail.

Snowfinches and ground-sparrows have more elaborate songs than the songs of other members of the family. They are delivered from a prominent perch or in display-flights. Unfortunately, their calls, and the contexts in which they are uttered, have not been analysed in the same detail as have those of the *Passer* sparrows.

Food and Feeding

Detailed studies have been carried out on the diets of four species of *Passer*, the House, Spanish, Sudan Golden and Eurasian Tree Sparrows, on the Common Rock-sparrow and on the White-winged Snowfinch, both by analysis of crop and stomach contents, and by the use of neck collars on nestlings. Limited information is available on the diets of the other species, and that mainly from casual observations, although the little that is known suggests that the types of food taken are broadly similar, the variations reflecting availability, rather than pronounced differences in food preferences. Specialization on different types of food can be seen in areas where two or more passerids occur sympatrically, the diet spectrum broadening in areas where there is no overlap and competition is reduced. For the less well-researched species, however, information of this kind is mostly lacking.

All members of the family are basically seed-eaters, specializing on the seeds of grasses, the cultivated cereals derived from them, and small herbs. Many of the data originate from areas in which the birds are, or have been, perceived as pests of arable crops (see Relationship with Man). The nestlings of all of the species are reared predominantly on animal food, consisting of insects and other invertebrates, particularly the larval forms. In the case of the House Sparrow, this is essential for the first three days of life if the young are to survive, although an increasing proportion of vegetable matter is fed to the chicks towards the end of the nestling period. At this time the adults themselves also consume some animal food, the proportion of which and the period of the year in which it is taken varying greatly among the different species and varying also in different parts of the range of those species with extensive distributions. This makes it difficult to make an economic judgement, as many of the insects taken by sparrows are themselves pests of agriculture. The digestive tract of the Desert Sparrow is shorter than that of other species in this family (see Morphological Aspects), and it is suggested that it takes a higher proportion of animal food than the House and Saxaul Sparrows, with which it overlaps in different parts of its range.

Stomach-content analyses have revealed that cultivated grain can make up to 75% of the diet of the House and Spanish Sparrows, with oats and wheat predominant, and barley, millet, rice and other cereals featuring less regularly. The Sudan Golden Sparrow, one of the smallest sparrows, feeds on small millet and rice, but the latter only after it has been dehusked. The balance of the vegetable diet is made up of the seeds of grasses and small herbs, and these are the preferred foods of the Eurasian Tree Sparrow, although rice and millet, and even the larger wheat grains, are also taken. Cereal grains on the plant in the early "milk" stage, when the grains are still soft and contain a milky white fluid, not only are taken by the adults, but also are fed to the older nestlings.

Rock-sparrows likewise eat some cereal grains, but, as they have much less contact with cultivation than true sparrows, they feed predominantly on the seeds of grasses and small herbs. The Common Rock-sparrow forages mostly on the ground, where, having a stouter bill, it tends to take larger seeds than those consumed by the true sparrows. The bush-sparrows are much more arboreal than the other members of the family and, while they will forage on the ground in the manner of the true sparrows, they obtain a lot of their food in the trees, examining the leaves in tit-like fashion and, in particular, using the finer bill to search under the bark for insects. The snowfinches and ground-sparrows



Sudan Golden (Passer luteus) *and* ***Arabian Golden Sparrows*** *are highly gregarious, and outside the breeding season forage in flocks that can include thousands of birds. Foraging flocks progress by "roller feeding", in which the birds at the back continually overfly those at the front. The smallest species in the family, they take correspondingly smaller seeds, such as millet and sorghum. They are considered a serious agricultural pest because of the sheer number of birds that may descend on a cereal crop, but they also help by taking the seeds of weeds from ploughed ground. In one study of stomach contents throughout the year, weed seeds made up 55% of the diet, and cereal grains 30%.*

[*Passer euchlorus*, near Al Dohi, Tihama plain, Yemen. Photo: Peter Ryan]



Although less dependent on humans than most other Passer *sparrows, the* ***Dead Sea Sparrow****, shown here on the left, with a female House Sparrow* (P. domesticus)*, has benefited from man-modified landscapes. Until the 1950s, this species occurred mainly in river- and lake-side habitats, surrounded by semi-desert, where a flush of annual grasses following the winter rains provided a good supply of seeds. The increase of irrigated agriculture in semi-deserts has allowed the Dead Sea Sparrow to extend its range. Its diet also includes the seeds of plants growing in and around water, such as papyrus* (Cyperus papyrus).

[*Passer moabiticus moabiticus*, Israel. Photo: Markus Varesvuo]

that inhabit areas above the level of cultivation feed mainly on the seeds of alpine plants.

Sparrows living in urban areas, especially the House, Eurasian Tree, Italian and Spanish Sparrows, but also some of the other species that penetrate inhabited areas, including the Common Rock-sparrow, the White-winged Snowfinch and some of the ground-sparrows, take food scraps provided by humans, such as bread, cooked vegetables, and meat fibres. Even so, they still prefer seeds and cereal grains if these are available. With the increasing number of Eurasian Sparrowhawks (*Accipiter nisus*) in urban habitats, it is very noticeable that the behaviour of these birds, particularly that of the House Sparrow, has changed. Where they formerly stayed in the open in places where food is available, they now tend to remain in cover, making quick sorties to snatch some food and then retreating back to the cover in order to eat it. In Asia, both the House Sparrow and the Eurasian Tree Sparrow come into the open-fronted shops to plunder any available food. Feed put out for chickens, pigs and other domestic animals is also exploited. In addition, a wide range of vegetable matter is taken opportunistically by all members of the family. This includes buds, green shoots, flowers, tree seeds, a variety of soft fruits, and nectar from flowers; the last has given rise to frequent reports of birds with yellow staining on the breast and forehead, at times even to the extent of making identification of the species difficult. The Cape Sparrow (*Passer melanurus*) has become a pest of viniculture in some areas of South Africa, where



Among the species that have exploited urban environments most successfully, scraps from cooked meals are a regular food source. However, the ***House Sparrow*** *and the Eurasian Tree Sparrow* (Passer montanus) *both prefer seeds when they can get them. Famously bold and confiding with humans, House Sparrows are changing their behaviour in places where Eurasian Sparrowhawks* (Accipiter nisus) *are on the increase. Instead of remaining fully in the open, they make quick sorties to snatch food, which they carry back into cover to eat. This parallels their behaviour in agricultural fields, where they tend to feed at the edges, within a few metres of the cover of hedges or grassy banks.*

[*Passer domesticus domesticus*, Germany. Photo: Roland Seitre]



Although found in semi-arid regions with annual rainfall of less than 750 mm, the ***Cape Sparrow*** *needs to drink regularly, and is seldom found far from a water source. Most members of this family are dependent on water for drinking. Species occurring in semi-arid habitats tend to be found near natural watercourses, or make use of irrigation channels and fish ponds. If water is not available in its feeding and breeding areas, the Saxaul Sparrow* (Passer ammodendri)*, for example, will fly considerable distances several times a day to drink.*

[*Passer melanurus damarensis*, Kgaligadi Transfrontier Park, South Africa. Photo: Geoff McIlleron]

it feeds on the ripening grapes; it is thought that the sparrows were first attracted to the weeds that grew between the irrigated vines, and from there moved on to the grapes themselves.

The range of animal foods is just as wide. Soft-bodied insects, caterpillars, grubs and aphids (Aphidoidea), or larger insects with the hard parts removed, are given to the very young nestlings. Later, more chitinous invertebrates such as spiders (Araneae), beetles (Coleoptera), particularly weevils (Curculionidae), and grasshoppers and crickets (Orthoptera) seem to be favoured, although cranefly larvae (Tipulidae) are preferred by the snowfinches, but any slow-moving invertebrate that is locally plentiful will also be taken by the members of this family. During the breeding season, this animal food is consumed by the adults, as well as being fed to the young. In addition to invertebrates, small amphibians and reptiles are regularly reported in the diets of the Passeridae, and small lizards seem to be a particular speciality of the Italian Sparrow. The House Sparrow is virtually omnivorous, even taking small molluscs and crustaceans along the shoreline.

Seeds are taken both from the ripening plants and from the ground where they have fallen or been spilt. In addition, undigested seeds are taken from animal droppings. In the case of cereals and the larger grasses, the sparrow will fly up from the ground and pull the seedhead down to ground level, frequently breaking the stalks. Many species employ the technique of "roller feeding", in which the individuals at the rear of the flock continually overfly those at the front, so that the whole flock progresses in one direction.

The Passeridae obtain invertebrates by searching on the ground and among the leaves of trees, or by hovering in front of vegetation. They also systematically search the boles of trees. They catch larger insects by pouncing, either from a perch or after hovering low above the ground; larger prey items are caught particularly in the early morning, when they are still torpid. In addition, sparrows catch insects in flight. It is mainly ants (Formicidae) and termites (Isoptera) in the flying stage that they capture in the air, although they seize larger insects, too; for example, they catch bees (Apoidea) coming out of a nest and snap up butterflies (Lepidoptera) in flight, although they are much clumsier than the Old World flycatchers (Muscicapidae) in this technique and may have to make long chases before successfully catching a butterfly. A particular example of exploitation, adopted by several of the passerid species that live close to man, concerns the catching of insects around bright lights at night or the collecting of dead or dying ones on the ground below. This behaviour makes it possible for the adults to feed nestlings right through the night at such places as airports. Sparrows also collect dead insects from motorcar radiators and from the fronts of railway locomotives. Moreover, the ground-sparrows, possessing a stronger bill, will dig into the soil in search of invertebrate prey.

Several studies, mainly of captive sparrows, suggest that the birds require an average of 150–250 kJ per day throughout the year. This translates into about 2–6 g of seed per day, depending on the calorific value of the seeds in question. Feeding bouts are interspersed with periods of rest, during which the seeds are digested. During these rest periods, the true sparrows resort to thick



At the beginning of the breeding season, the unpaired male ***Spanish Sparrow*** *either takes over an old nest, or lays the foundation of a new one. He advertises this site with a "song" consisting of rapidly repeated chirps, "cheeli-cheeli-cheeli". Louder than the song of the House Sparrow* (Passer domesticus)*, this can be heard from several hundred metres away. In the accompanying display, very like that of other* Passer *sparrows, he droops and shivers his wings, spreads and raises his tail, and raises his head to expose his black bib. If he attempts to mate before the female is ready, she rejects him aggressively.*

[*Passer hispaniolensis hispaniolensis*, Bulgaria. Photo: Konrad Wothe]

cover, where they frequently indulge in bursts of social singing (see Voice).

The members of this family regularly drink when water is available, but some of those living in the more arid regions appear to obtain most of their water from the food that they eat. Grit is also taken regularly by sparrows, and is retained in the stomach as an aid to grinding up food. The amount retained varies, from a mean of 210 mg in the House Sparrow, with as many as 3,000 separate particles, to 175 mg in the Eurasian Tree Sparrow. Data of this nature are, of course, not available for the great majority of the passerid species. The choice of grit is not random. House Sparrows, for example, show a preference for angular particles about 0·5 mm in size, and hold on average more grit in the gizzard when they are feeding on hard seeds than when taking softer animal food. Females also take snail shells as a calcium supplement during the egg-laying period.



This photograph is part of a sequence showing previously undocumented and so far unexplained behaviour, in which a pair of ***House Sparrows*** *each held objects in their bills during copulation. The male was perched on the swallow's nest carrying a white feather when the female arrived, holding a petal of Spanish Lavender* (Lavandula stoechas). *During the six or seven bouts of copulation that took place over the next three minutes, the male dropped the feather, but the female kept hold of the petal.*

[*Passer domesticus domesticus*, Monfragüe National Park, Extremadura, Spain. Photo: Nicole Bouglouan]

Breeding

The Passeridae are essentially monogamous, and colour-ringing has shown that, for the sedentary populations of House Sparrows and Eurasian Tree Sparrows, the mated partners normally remain together for life. For these relatively short-lived species, this rarely extends beyond two breeding seasons, although one pair of House Sparrows has been recorded as breeding in the same nest for six consecutive seasons, rearing two or three broods each year. Apart from a brief period at the end of the breeding season when the birds may move away a few kilometres to exploit a ripening grain field, the nest is held throughout the year, often being used for roosting by at least one of the pair, and is defended against rivals. The nest may, in fact, provide a focus for the pair, but away from it the partners obviously recognize each other and spend much time together. Nest-site ownership is clearly not so strong among the other species in the family, and the extent to which partners of these species remain together throughout the year is not known.

In the case of the sedentary sparrows, an unmated male takes over a nest-site at the beginning of the breeding season and adds nesting material, showing ownership by advertisement-calling. On the appearance of a female, the calling speeds up and becomes more strident; this is particularly the case with the Spanish Sparrow, which can be heard at a distance of several hundred metres. If the female is interested, the pair quickly becomes established. Once the pair has been formed, both members carry on with the building of the nest, which may be completed some weeks before egg-laying begins. In the event of the loss of one of the partners at this stage, the remaining sparrow, be it male or female, continues to hold the nest and quickly attracts a new mate. This mate-replacement phenomenon continues throughout the breeding season, suggesting that there is a population of "floaters" that have up to then been unable to join the breeding population. With these sedentary species, there is a recrudescence of sexual activity after the moult, and a bird that disappears is quickly replaced, some birds of the year becoming nest-holders at this time.

The majority of the species in this family breed generally in loose colonies, but at times with the nests closely packed and touching one another. This is evident with, for example, Eurasian Tree Sparrows nesting in the base of large nests of storks



Most sparrows nest in colonies, but two of the species forming the rufous-sparrow superspecies, the Southern Rufous (Passer motitensis) *and* ***Kenya Rufous Sparrows****, are solitary nesters. The Kenyan species is also one of few that place the nest openly in the branches of trees rather than in a hole or another concealed site, although it has been known to build in more sheltered sites, behind creepers or in deserted weaver (Ploceidae) nests. As in the rest of the Passeridae, both sexes build the nest, which in this species is a loose, domed structure the size and shape of a rugby ball, made mainly of grass.*

[*Passer rufocinctus*, Lake Naivasha, Kenya. Photo: Neil Bowman/FLPA]



*The untidy globular nests of **Chestnut Sparrows** are sometimes built in single-species colonies, but may also be situated in colonies of weavers (Ploceidae). Instead of building its own nest, the Chestnut Sparrow may take over an abandoned weaver nest, or eject the weavers from an occupied nest, and some Chestnut Sparrow colonies consist entirely of nests from which weavers have been displaced. The male gives his ownership display from the weaver's nest, sometimes while it is still occupied, attracting a female, and she helps him drive out the weavers. It has been suggested that this species is evolving from a "normal" breeder to a nest parasite.*

[*Passer eminibey*, Yabelo Wildlife Sanctuary, Ethiopia.
Photo: Dick Forsman]

(Ciconiidae) or birds of prey, and with tree-nesting Spanish Sparrows. The nests of Sudan Golden Sparrows in the branches of trees may also be close together, but not so close as to be in contact. When nests are very close together, the stealing of nest material is common and there is much agonistic behaviour; neighbouring individuals appear to recognize each other, although still attacking unfamiliar birds. Among those true sparrows that breed in loose colonies, and the Common Rock-sparrow, the bush-sparrows, the snowfinches and the ground-sparrows, the pairs are strongly territorial so far as the nest is concerned, but they join into flocks outside the breeding season.

Colonial breeding is most highly developed in the Sudan Golden and Spanish Sparrows. Colonies of the former containing up to 65,000 pairs have been reported from Senegal. The nests are built in thorny trees, with 20–30 nests in one tree; in the arid region where the birds breed, trees tend to be scattered so that the colony is not closely packed, although 570 nests/ha have been counted in Niger. The Spanish Sparrow is even more gregarious, particularly in the eastern parts of its range, where breeding colonies contain from 100,000 to as many as 800,000 pairs, and an estimated 2,500,000 birds of this species nest in one square kilometre. This means not only that the largest colony is twelve times greater than that of the Sudan Golden Sparrow, but also that the nests are much more densely packed. Whereas the nests of the Sudan Golden Sparrow are spaced and there is much agonistic behaviour between neighbouring pairs and much stealing of nest material, those of the Spanish Sparrow are at times so close together that they form a continuous mass. Up to 180 Spanish Sparrow nests have been counted in one tree in Spain, and as many as 20 in the base of a single nest of a European White Stork (*Ciconia ciconia*).

Even with the Sudan Golden and Spanish Sparrows, the above-mentioned figures represent the extremes, and much smaller and looser colonies also occur. This is the tendency too for most of the other true sparrows, 20–30 pairs being far more typical for such species as the House Sparrow, Eurasian Tree Sparrow, Dead Sea Sparrow, Sind Sparrow and Cape Verde Sparrow, among others. The breeding associations form a clumped distribution even in areas apparently offering equal nesting opportunities, so that the birds can thus be fairly described as colonial breeders by choice, rather than as a result of habitat restriction. This is borne out by the current decline of the House Sparrow population nesting in urban areas in Britain (see Status and Conservation). As numbers have fallen, the "colonies" have maintained their average size, but the nests have become more widely spaced, the birds withdrawing from areas which were formerly suitable for breeding and which do not appear to have changed in this respect.

The rock-sparrows and the snowfinches tend to nest in similar loose colonies, although, with the hole-nesting species, the structure and spacing of the colony depends more on suitable nesting opportunities than is the case with the tree-nesting species. The ground-sparrows, however, are more territorial, although they do associate in flocks outside the breeding season.

Solitary nesting also is practised by many of the Passeridae, but only for one, the Southern Rufous Sparrow of southern Africa, is this the rule. Nests of this species are rarely, if ever, less than one kilometre apart, and even outside the breeding season this sparrow is seldom seen in flocks other than single family parties.

Breeding is linked with the normal succession of the seasons in temperate regions, but for those species living in the tropics it tends to coincide with the local rains, perhaps giving rise to separate breeding attempts at different times of the year. Synchronization of breeding occurs in the colonial species, resulting in peaks in the timing of laying of the clutches, although this becomes less marked as the season progresses, replacement clutches tending to disrupt the cycle.

For nesting, the majority of the members of the family use covered sites, especially holes in trees, cliffs and buildings, but they nest also in creepers and more openly in the branches of trees. The nests are usually domed, and this is true even of those built in more open sites in trees, in which they are securely interwoven with the branches. Passerid nests are normally constructed from dried grass and plant stems, and lined with a soft pad of



In the absence of competition from House Sparrows (Passer domesticus), ***Spanish Sparrows*** *will nest on buildings, but otherwise they tend to choose natural sites, including trees, and the nests of larger birds such as raptors, crows and storks. The loose grass of the nests of a sizeable colony can be seen spilling out from this European White Stork* (Ciconia ciconia) *nest. Spanish Sparrows tolerate much closer proximity of nests within their colonies than most other sparrow species. The nests here are packed so closely together that the material has become intermingled. Up to 20 pairs of Spanish Sparrows have been found in a single stork's nest, and in Spain, 180 nests were counted in one tree. In the east of its range, colonies can contain from 100,000 to as many as 800,000 pairs.*

[*Passer hispaniolensis hispaniolensis*, Lake Kerkini, Greece. Photo: Manfred Pfefferle]

hair, fur or feathers. The snowfinches nest in crevices in rocks and under boulders, whereas the ground-sparrows use almost exclusively the burrows of small mammals, normally the only covered site in the sparsely vegetated high-altitude steppe habitat in which they live. Even when covered sites are used, the nest is usually still domed, although it may be reduced to a mere pad in the case of some of the bush-sparrows and rock-sparrows, the snowfinches and the ground-sparrows. The Chestnut Sparrow of tropical Africa not only builds a nest openly in the branches of trees, but is also a nest parasite, usurping the nests of a number of ploceid weaver species. Similarly, the House Sparrow will sometimes take over the nest of another species, such as that of a Northern House Martin (*Delichon urbicum*), and this versatile species has also been recorded as living and breeding 640 m below ground in a coal mine in South Yorkshire, in England. The one striking exception within the family is the Pale Rock-sparrow, which builds an open cup-nest in a bush, more like that of a finch than like the typical nest of a sparrow.

The clutch size is typically of three to five eggs. In the case of the true sparrows in the genus *Passer*, both sexes take part in incubation, although the males, as they do not develop a brood patch, can be said only to cover the eggs, rather than truly incubate them. With the population of the Dead Sea Sparrow nesting in the Dead Sea Depression, the ambient temperature during the day is such that incubation is not required. Here, the female even prevents the male from entering the nest during this period, although in areas with less high temperatures pair members behave more normally. Similarly, there may be no need for incubation during the day for Desert Sparrows living in hot regions, and true incubation takes place only at night. Both the Dead Sea Sparrow and the Sudan Golden Sparrow, the latter living in the high-temperature tropics, build open-structured nests of small twigs, rather than of grass, which shelter the eggs from the direct heat of the sun and at the same time allow circulation of cooling air that prevents overheating of the clutch.

Incubation periods of the Passeridae are typically 12–14 days, but that of the Sudan Golden Sparrow, which has adapted to a short window in which the local conditions may be suitable for successful breeding, lasts for only 10–12 days. In all of the species for which relevant information is available, both sexes bring food for the nestlings and both continue to feed the young for up to two weeks after they leave the nest. If the female lays a new clutch, however, most fledgling feeding is done by the male. The fledging period for most of the species is typically 14–17 days, although, again, the Sudan Golden Sparrow is the exception, with a fledging period of only 13–14 days. The window of opportunity for breeding in the Sahel, where the Sudan Golden Sparrow occurs, can be very short. This results not only in a high degree of synchronization, but also in a breeding cycle that is shorter by five or six days than that of other sparrow species. With suitable conditions of such comparatively brief duration, the birds, having bred once, may then move to another location for a further breeding attempt, those pairs that started late in the cycle deserting their nests and moving on with the flock. The Spanish Sparrow is another species for which, in certain parts of its range, conditions suitable for breeding may be of limited duration. This sparrow is adapted to breeding in areas with a Mediterranean-type climate where there is a short flush of vegetational growth, with an associated flush of insects, before a long hot, dry summer sets in. Some populations of Spanish Sparrows accommodate to this by moving for successive broods to areas in which the conditions become suitable later in the year (see Movements).

In contrast, the White-winged Snowfinch has a longer fledging period, amounting to 18–22 days, suggesting a limited availability of food for the young. This may be typical of the other high-altitude snowfinches and ground-sparrows, but data for these species are lacking.

Since the complete breeding cycle takes only four to six weeks, there is ample opportunity for several broods to be raised in most areas. The majority of the species lay two to four clutches, and as many as six breeding attempts by House Sparrows have been recorded in India, although breeding can be interrupted during the monsoon, the birds then taking the opportunity to begin the moult when conditions are not suitable for breeding.





Hole-nesting species make use of a wide variety of natural and man-made sites. The highly social ***Common Rock-sparrow*** *breeds mainly in loose colonies of up to 100 pairs. Its nests are placed in crevices in rocks, rodent burrows or the nesting tunnels of birds such as bee-eaters (Meropidae) or Collared Sand Martins* (Riparia riparia). *They also make use of holes in ruined or isolated buildings, and occasionally in occupied buildings. The nest material, grass lined with feathers and animal hair, fills the space available. The nests are often domed, like those of the genus* Passer. *Spacing depends on the availability of holes, but at times Common Rock-sparrow nests may be only a few metres apart. The* ***Desert Sparrow*** *nests alone or in small colonies. In Africa this species most often nests in holes in trees and deserted buildings. Elsewhere, it sometimes builds nests in open sites, such as the dense branches of thorny trees and the crowns of palms. The nests are tightly interwoven with the branches of the tree. Built of plant fibres and coarse grass, they are domed, with a side entrance sloping up to a nest cup of finer grass, fibres and feathers. Nests may also be found in the understoreys of large crow or raptor nests. Both partners work on the nest, and continue to add material until the first young hatch. In hotter parts of the range, these birds may not need to incubate the eggs during the day, and sites such as the bases of large nests of other species may be favoured because they shelter the eggs from the direct heat of the sun, which could overheat them.*

[Above: *Petronia petronia petronia*, Valladolid, Spain. Photo: Alejandro Torés.

Below: *Passer simplex saharae*, Morocco. Photo: Roger Tidman/ FLPA]

Despite the apparent faithfulness of paired individuals of the House Sparrow that is suggested by close observation of colour-ringed birds, DNA studies have revealed that there is a considerable degree of promiscuity. Indeed, it has been found that a significant percentage of eggs in a nest have not been fertilized by the male nest-owner. This is particularly evident in colonies where the nests are close together, and in such colonies some females may even lay in neighbouring nests. This is not a case of nest parasitism; rather, the female mates with the owner of the neighbouring nest, presumably as a means of increasing the probability of ensuring the propagation of her own genes. Intriguingly, these molecular-genetic studies have shown that 10–20% of nestlings have not been fathered by the male partner of the pair feeding the young, a figure remarkably similar to the reported rate for the human population living in apartment blocks in England.

Data on breeding success are available for only a few well-researched species, such as the House Sparrow and the Eurasian Tree Sparrow. The figures exhibit an extremely wide scatter, the values for the percentage of eggs laid giving rise to fledged young ranging from 30% to 95% in different studies. Published data suggest only a 30% breeding success for the Desert and Dead Sea Sparrows, although it is not known whether this low value is typical for these species or is merely a reflection of the fact that it is derived from very restricted studies and is not truly representative of the species concerned. Studies of the widespread House and Eurasian Tree Sparrows suggest an annual productivity of 3–10 fledged young per pair per year. Again, data on life expectation appear to be limited to these species. As might be predicted for a small passerine, the life expectancy of the adults is short, less than two years, although ringing recoveries have shown that individual Eurasian Tree Sparrows have lived for four years, Spanish Sparrows for eight years and House Sparrows for an astonishing 13 years in the wild. It is perhaps not surprising that these three are among the most successful of the sparrows, with a track record of successful colonization.

Movements

Although the Passeridae include some of the most sedentary of all wild birds outside the tropical forests, most of its members do make movements of some kind. These range from a truly directed seasonal movement undertaken by some species, or at least by some populations, to the nomadism exhibited by some tropical species and to a post-breeding dispersal, particularly of juveniles, or local movements involving flights of only a few kilometres to reach a seasonal food source. At the other extreme, many House Sparrows, for example, live out their whole life within a compass of no more than one or two kilometres.

The subspecies *cinnamomeus* of the Russet Sparrow and the subspecies *parkini* of the House Sparrow, breeding at high altitudes in the Himalayas, have a regular vertical migration to lower altitudes. In the case of the Russet Sparrow, for example, this may involve a descent of 2–3 km, but with a lateral displacement of only 10–25 km. In contrast, the nominate race of the Russet Sparrow, which breeds on the island of Sakhalin, in much of Japan, and in northern China, withdraws completely to the south, to spend the winter months well away from the breeding area. House Sparrows and Eurasian Tree Sparrows living at high latitudes in Siberia either shift south or move into built-up areas in the winter. The race of the House Sparrow, *bactrianus*, that breeds in southern Siberia, the Central Asian republics and Afghanistan is a summer visitor in those areas, wintering in the plains in the north of the Indian Peninsula.

As already indicated (see Breeding), Spanish Sparrows have a rather different type of migratory behaviour. They carry out extremely complex seasonal movements in north-west Africa, searching for suitable breeding areas in response to annual variations in rainfall, whereas, to the east, movements appear to be more directed, the sparrows moving northwards for successive breeding attempts in order to take advantage of the flush of food that coincides with the advancing Mediterranean-type spring as conditions become progressively more favourable towards the north and east. This migration reaches as far as Kazakhstan, southern Siberia and extreme north-west China. It results in a spectacular autumn passage as the birds return south through the passes of the Tien Shan to the northern plains of India, where they spend the winter.

Like the Spanish Sparrow in north-west Africa, the Sudan Golden Sparrow of the Sahel region, farther south in Africa, is nomadic. This sparrows follows the rains, breeding in enormous concentrations when there is a flush of vegetation, with the attendant insects on which it relies for the rearing of its young.



The ground-sparrows not only breed but also roost and shelter in the burrows of rodents. These are often the only sheltered sites in the sparsely vegetated regions of high-altitude steppe where they live. Each species tends to be associated with one or more species of small mammal. ***Blanford's Ground-sparrow****, for example, nests mainly in the burrows of pikas* (Ochotona) *or Brandt's voles* (Microtus brandti), *and Small Ground-sparrows* (Pyrgilauda davidiana) *in those of susliks* (Citellus), *pikas and hamsters* (Cricetus). *The nest may be up to a metre from the entrance to the burrow, and consists of a mat of grass and other plant material, lined with fine vegetable fibres and animal hair.*

[*Pyrgilauda blanfordi*, China. Photo: Axel Gebauer]



In the Passer *sparrows, both parents incubate the eggs. This is thought probably to be the case too with the* ***Black-winged Snowfinch****, although in the closely related White-winged Snowfinch* (Montifringilla nivalis)*, the female alone appears to incubate. In all species for which the information is available, both parents bring food for the nestlings; this is certainly true for the Black-winged Snowfinch. Clutch sizes in this family are within the range 3–5, and the eggs are incubated for 12–14 days.*

[*Montifringilla adamsi*, China.
Photo: Dong Lei]

A much more limited movement, but nonetheless a regular one, occurs among otherwise sedentary populations of House Sparrows living in villages and on the outskirts of towns. These birds will abandon their breeding colonies and take up temporary residence in the surrounding countryside a few kilometres away, where they take advantage of the availability of the ripening grain, returning to the colony areas once the grain has been harvested.

Post-breeding dispersal is a much more significant feature of the *Passer* species than any true migration, and the distances involved may be quite limited. This is the mechanism whereby gaps in the breeding population are filled, and new colonies become established in suitable areas. It is also the one by which the remarkable colonizations of birds introduced in new areas have certainly taken place. At the beginning of the nineteenth century, the House Sparrow in the Palearctic Region extended as far east only as the Urals, yet with the exploitation of Siberia for agriculture, and the building of the Trans-Siberian Railway, it had, by the 1920s, spead to the mouth of the River Amur, on the Sea of Okhotsk, an extension of range of some 5000 km in a little over 100 years. Similar range expansions were achieved by the sparrows introduced in the latter half of the nineteenth century in North and South America, South Africa, Australia and New Zealand. For example, the first successful introduction of House Sparrows in North America took place in New York in 1852; by the end of the century the species was present northwards to the limits of cultivation in Canada, and had penetrated the Mexican border to the south. Although some of this increase can be attributed to secondary releases, most of it must have occurred by natural post-breeding dispersal. The expansion continues, and House Sparrows have recently reached the north of Venezuela, having become established along the Caribbean coast from Maiquetía (Caracas Airport) in the east to the Paraguaná Peninsula in the west. They are now also approaching the south of the country from Colombia, having reached there from Chile, where they were introduced in 1904, and through Amazonia, in Brazil, where they have spread north from Rio de Janeiro, in which they were released in 1905.

The Eurasian Tree Sparrow has not been so dramatic a colonist as has its congener, but it has nonetheless expanded its range in the last 150 years over the archipelagos of South-east Asia and the islands of the Mediterranean. There is little doubt that some of this was a consequence of deliberate introduction, but equally much of it was a result of natural spread through post-breeding dispersal, and has included the phenomenon of individuals taking involuntary rides on ships. This has occurred also with the House Sparrow, and even to the extent, it is reported, of hitching lifts on inter-island aircraft in the Azores. A juvenile House Sparrow, which boarded PanAm Flight 811 from Los Angeles to Sydney on 4th July 1981 (Independence Day!), was not welcomed by the Australian Quarantine & Inspection Authorities in Sydney, who promptly dispatched it!

This spread by dispersal is by no means limited to the introduced species. The Southern Grey-headed Sparrow has spread over much of the former Cape Province, in South Africa, since about 1950, an expansion of range of 800 km in only 35–40 years. There is no indication that this was in any way deliberately assisted by man, although it may, of course, have been triggered by changes in land use.

Less is known about the movements made by members of the other genera of the family. Most of the bush-sparrows either perform limited migratory movements or are nomadic outside the breeding season. The Pale Rock-sparrow of the monotypic genus *Carpospiza*, on the other hand, is almost completely migratory, breeding in south-east Turkey, the Levant and south-west Asia and wintering mainly in the Arabian Peninsula and north-west Africa. In the winter months, the snowfinches remain at high altitudes close to the snow-line or move into high-lying settlements, whereas the ground-sparrows breeding at high altitudes are more nomadic, descending to lower elevations or withdrawing to the outskirts of settlements in the winter.

Relationship with Man

The true sparrows, those in the genus *Passer*, have a closer relationship with humans than any other genus of wild birds, and 17 species out of the 26 have been recorded nesting on man-made buildings and feeding around habitations. In contrast, the other genera in Passeridae are much less associated with man. The rock-



All passerid nestlings are fed an exclusively animal diet to begin with, though their parents may bring them an increasing amount of plant food towards the end of their time in the nest. In their first few days, ***Eurasian Tree Sparrow*** *nestlings are fed on aphids and other small insects and spiders. As they grow, the size of the prey increases to include caterpillars, grasshoppers (Orthoptera) and beetles (Coleoptera), particularly weevils (Curculionidae). While the chicks are small, the parents strip the prey of hard parts such as the legs and wing cases.*

[*Passer montanus montanus*, Berbegal, Huesca, Spain. Photo: Ricardo Vila]

sparrows and bush-sparrows tend to occupy rough uncultivated land or light woodland, where they make little contact with man; similarly, the snowfinches and ground-sparrows live at high altitudes, where man has had little impact on the environment, although some species do move close to settlements to feed on waste and on seeds and insects in the dung of domestic herbivores. Three of these have been recorded as nesting on houses, although this habit is much less frequent in occurrence than is the case with *Passer*.

The association of the true sparrows varies from one species to another. The House Sparrow, for example, lives almost exclusively in complete dependency with man, not only living in built-up areas, including the environment of farms, but also nesting in buildings and at times even moving into the buildings themselves, and in the eastern part of its range the Eurasian Tree Sparrow behaves like a complete "house sparrow". With the other species, such as the Spanish Sparrow, the Pegu Sparrow, the Cape Verde Sparrow and the African grey-headed sparrow superspecies (see Systematics), to name just a few, the association is a more casual one, only a proportion of the population occupying the built-up environment.



In the tropics, some widely distributed species can be found breeding somewhere in their ranges at almost any time of the year, according to the local rainy season. The ***Yellow-throated Bush-sparrow****, for example, breeds from August to November in northern South Africa, October to January in eastern South Africa, and January to February in Namibia.*

[*Gymnoris superciliaris flavigula*, Marondera, Zimbabwe. Photo: Peter J. Ginn]

Perhaps unsurprisingly, evidence of the close relationships with man of the House Sparrow and the Eurasian Tree Sparrow goes back a long way. House Sparrows are mentioned in the Old Testament of the Christian bible, first written down in ancient Hebrew 200–300 years after Christ, and the first mention of the Eurasian Tree Sparrow is in the *Kojiki*, the earliest written book in Japanese, which is dated to the year 712. It is not certain if the words used, *tsippor* in Hebrew and *suzume* in Japanese, refer specifically to the two sparrows in question or merely to generalized small, brown birds, but from the context in which they are used the latter seems the more likely. There is no such doubt, however, about the birds appearing in the painting "Sparrows in Rice Paddy" by the Chinese artist Han Ruazhuo, who was active in the period 1110–1125; they are Eurasian Tree Sparrows. The attitudes of humans towards sparrows range from one of hatred to one of affection and love, with several of the species regarded by farmers as pests in cereal fields, or valued as food, or as laboratory animals, or as pets, and some also as subjects of art and holding a place of affection in the hearts of many human city-dwellers.

The designation of the House Sparrow as a pest led to the formation in many parishes in England of what were termed "Sparrow Clubs", dedicated to the extermination of the birds; such clubs were in existence from the sixteenth to the nineteenth centuries, paying bounties for the destruction of eggs, nestlings and free-flying sparrows. In Germany, massive poisoning campaigns were carried out in the period immediately after the Second World War. More recently, similar campaigns to destroy roosts and breeding colonies have been launched against Spanish Sparrows in the Central Asian republics and against the Sudan Golden Sparrow for it depredations on crops of the small millet and sorghum (*Sorghum*) in central Africa. This is a particular problem with these two sparrow species, which can gather in immense concentrations and cause significant local damage, in some cases even total loss of the crop. Control measures have been taken, for instance the felling of the trees used for nesting as well as feeding the birds with poisoned grain in Kazakhstan and Kyrgyzstan, and setting fire to roosts in Sudan; the extent to which



Since the complete breeding cycle takes only four to six weeks, there is plenty of opportunity for several broods to be raised in areas where a relatively long spring is followed by a mild early summer. The male takes on most of the work of feeding the fledglings while the female incubates the second clutch. Although sometimes considered a hybrid between the House (Passer domesticus) *and Spanish Sparrows* (P. hispaniolensis), *the* ***Italian Sparrow*** *appears to have a shorter breeding season than either of these species. It rarely raises more than one or two broods, because of the short spring in Italy and the Mediterranean islands where it breeds. Like the Italian Sparrow, the Spanish Sparrow is adapted to breeding in areas with a Mediterranean-type climate, where a short, wet spring is followed by a long, hot, dry summer, in which vegetation dies back and insect numbers are reduced. Some populations of Spanish Sparrows, particularly of the eastern race* transcaspicus, *follow the spring, raising their first broods in the southernmost part of the range, and moving north in search of suitable conditions to raise a second and even a third brood. These successive breeding colonies are quickly assembled, with the nests packed tightly together, as in sedentary populations of this species. The same sites may be used in subsequent years, or not, if conditions are better elsewhere. This nomadic behaviour enables Spanish Sparrows to breed concurrently with sedentary populations of House Sparrow at times when food availability is at its peak and sufficient for both species.*

[*Passer italiae*, Peccioli, Tuscany, Italy. Photo: Daniele Occhiato]

these have been effective is not known. It is worth noting that studies of the Sudan Golden Sparrow in Niger in the 1980s revealed that this species did not damage rice fields, even at the end of the dry season, because the birds preferred to take seeds from the ground. Moreover, this sparrow consumes injurious insects and feeds its nestlings with locusts (Acrididae). It is considered, therefore, that, while this species may have a small adverse impact locally, it should not be regarded generally as a pest, and traditional bird-scaring methods should be sufficient to prevent flocks from causing serious damage to crops.

It is important to note that sparrows, when feeding their young, take considerable quantities of what are considered pest insects, so that it is difficult to strike an economic balance. The practice of giving bounties in England has long since been abandoned, and it can be concluded only that it was ineffective in controlling the number of birds. This is borne out by the results of an experiment undertaken on a large scale in China. In 1958, the country's then leader, Mao Tse-tung, designated the Eurasian Tree Sparrow an enemy on the grounds that, in China, these birds consumed sufficient rice annually to feed 60,000 people. In April of that year, a three-day campaign, involving three million citizens, was waged against the sparrows, destroying a significant proportion of the species' population. The expected gain in rice production, however, did not materialize, because of increased losses through insect attacks, and the idea was quickly forgotten. The Eurasian Tree Sparrows soon regained their original numbers and rice production recovered to its normal level. It was not, however, until 1999, when Mao was safely dead, that the species was afforded full protection in that country.

Sparrow pie was a common country dish in England up to the time of the First World War. Although sparrows have since disappeared from the menu in that country, they are now being offered as a delicacy in restaurants in the Latin countries, frozen birds being imported from China in large numbers, said to exceed six million per year, despite the protected status that they were given in 1999 after the Mao campaign debacle. The flesh and, most particularly, the brain of sparrows had a reputation for increasing sexual potency. This applied both to the Eurasian Tree Sparrow in China, where the species was known as the "hemp bird" for the inclusion of *Cannabis* seeds in its diet, and to the House Sparrow in Europe, no doubt for its reputation for lechery, which can be traced back as far as Aristotle, who lived in the period 384–322 BC.

It is significant how man's attitudes towards the House Sparrow have changed over the years. In 1559, the Lutheran pastor of Dresden, in Germany, was commended "for having put under ban the sparrows, on account of their extremely vexatious chatterings and unchastity during the sermon to the hindrance of God's word and Christian devotion". Four hundred and twenty years later, the Rector of a church in Lincolnshire, in England, was roundly condemned for having a sparrow in his church shot because it was interrupting a classical guitar concert. A mere twenty-six years after that, a television company in the Netherlands was fined for having a sparrow shot for interfering with an attempt to establish a world record in collapsing a row of more than four million dominoes.

Because it is perceived as a pest, has been unprotected in most countries, at least until very recently, and is easily taken from the nest and reared in captivity, the House Sparrow has been used extensively, particularly in the USA, as a laboratory animal. It has been the subject of physiological studies, including photostimulation experiments examining the effects of different cycles of light and dark on sexual development, metabolic requirements under controlled conditions, intelligence tests, and so on. In addition, many eggs, nestlings and free-flying individuals have been sacrificed for analysis for environmental contaminants such as heavy metals and polychlorinated biphenyls (PCBs), for the presence of pathological organisms and the effect of these on the development of the nestlings, and for the possibility that the birds may act as carriers of the latter, with the potential for transmission to man and his domestic animals.

The House Sparrow holds a strong place of affection in the hearts of many town-dwellers for bringing life to the urban environment and for its cheeky behaviour. This has been demonstrated by letters to the press and politicians, following the recent decline in the species' numbers, and in Britain, at least, these have resulted in questions in Parliament asking Her Majesty's Government what is being done about the situation. This is not merely



Possibly because of the limited availability of food at higher altitudes, the ***White-winged Snowfinch*** *has a longer fledging period than lowland members of the family. The fledglings are fed by both parents for around two weeks after leaving the nest. The young undergo a complete post-juvenile moult, beginning 1–3 months after fledging, at which point they become almost indistinguishable from the adults. Adults have a single annual post-breeding moult. Studies of House* (Passer domesticus) *and Eurasian Tree Sparrows* (P. montanus) *suggest annual productivity of 3–10 fledged young per pair per year. Adult life expectancy is less than two years, although ringed Eurasian Tree Sparrows have lived for four years, Spanish Sparrows* (P. hispaniolensis) *for eight, and House Sparrows 13 years in the wild.*

[*Montifringilla nivalis nivalis*, Dolomites, Italy. Photo: Menno Hornman]



*At the same time as extending its range in northern and southern Europe and South-east Asia, at least partly as a result of deliberate or accidental introductions, the **Eurasian Tree Sparrow** has undergone a massive decline in parts of its natural range in Britain and adjacent mainland Europe, and Japan. This is thought to be the result of the intensification of agriculture, with increased use of pesticides and herbicides, and the change from spring to autumn sowing of cereals, so that spilt grain and weed seeds are no longer available over the winter. Conservation measures such as provision of winter food and nestboxes appear to have stabilized the situation in Britain, and the species is beginning to show a modest recovery.*

[*Passer montanus*, Hanko, Finland. Photo: Dick Forsman]

a matter of sentiment, but also a reflection of the underlying worry that the House Sparrow is the modern equivalent of the miners' canary, giving us the message that what is happening to the urban environment today may affect humans tomorrow. One must not, however, overlook the fact that the sparrow has a bad reputation among gardeners because of its predilection for tearing flower petals, particularly those of yellow crocuses (*Crocus*), in the spring. This has been explained as being wanton destruction, but it is difficult to attribute wanton behaviour to animals other than man. It seems more likely that the sparrows are, in fact, eating the petals as fresh vegetable matter or obtaining some moisture from them; the behaviour is more common in dry springs, giving some support to the latter hypothesis. A possibly more significant concern is that sparrows, with their close association with human beings, could be potential transmitters of disease both to people and to their domestic animals. House Sparrows are hosts of the poultry red mite (*Dermanyssus gallinae*) and the chicken flea (*Ceratophyllus gallinae*), both of which are disease-vectors for domestic poultry. Further, these birds are carriers of the West Nile Virus, a flavivirus borne by mosquitoes (Culicidae) that causes encephalitis, and the Eurasian Tree Sparrow is a carrier of avian influenza, including the highly pathogenic H5N1 strain, which can be fatal to humans. While there is no evidence to show that sparrows have acted as vectors in the transmission of diseases to man and his stock, and the chance of contracting disease from them is probably very small, the potential risk cannot be completely discounted.

Abandoned sparrow chicks on the ground are a not unfamiliar sight in areas of human habitation, and many have been adopted as pets. Stories abound in the literature, going back to Roman times. The poet Catullus, whose life probably spanned the years 84–54 BC, wrote a dirge on the death of a pet sparrow, in this case no doubt an Italian Sparrow, belonging to his mistress, Lesbia. This was followed some fifteen centuries later by another mock heroic dirge by the English poet John Skelton, who lived in the second half of the fifteenth century and the early sixteenth century; his poem on the death of a pet sparrow belonging to a certain Jane Scrope is entitled *Lament for Phyllypp Sparrow*. Perhaps the most famous of these pets, however, is Clarence, the hero of *Sold for a Farthing*, a biographical story of a sparrow written by Clare Kipps; Clarence lived with his mistress for a remarkable twelve years. Many others tales must have gone unrecorded.

Finally, two species of sparrow have an important place in the world of art. The Eurasian Tree Sparrow has for centuries been an inspiration for Oriental painters, and many of their works are a source of delight for the way in which they have captured the essence of the bird in a few simple brush strokes. The famous sixteenth-century Japanese scroll "Kotohta, the Sparrow", which depicts the fable of how Kotohta was religiously awakened and became a Buddhist monk, is a delight not only for the Eurasian Tree Sparrows, but also for many other easily recognized species. Sparrows appear much less frequently in western art, one exception being the *Madonna del Passero*, "Our Lady of the Sparrow", painted by the Italian Baroque artist Guercino (1591–1666), the subject again being, as it happens, an Italian Sparrow. In contrast, sparrows feature much more frequently in European literature, dating back, as already mentioned, to the Roman poet Catullus and extending right up to the present day, with a recent poem by the former British Poet Laureate, Sir Andrew Motion, inspired by the decline in the population of House Sparrows.

Status and Conservation

No species in the family Passeridae is globally threatened, although there have been some recent major changes in the range and numbers of some species. These changes have involved mostly increases, both through deliberate introductions by man and as a result of alterations in the environment that have favoured those species closely associated with humans, particularly members of the genus *Passer*.

Introductions of animals in countries outside their natural range date back to the early history of man, but they received an enormous boost in the middle of the nineteenth century when immigrants from Europe began the process on a large scale, with the formation of "acclimatization societies" dedicated to this activity. Introductions were made for a number of reasons, including aesthetic ones, but also as a source of food and for the control

of insect pests. Perhaps the most successful introduction of all avian species has been that of the House Sparrow, in many cases because it was mistakenly thought to be predominantly an insectivore. This species, with its close association with man, quickly established itself, occupying a niche that had not been filled to anything like the same extent by any native species. As a result, the House Sparrow has become one of the most widespread, and possibly the most numerous, species of terrestrial bird. Another *Passer* that has been successfully introduced, although by no means to the same extent, is the Eurasian Tree Sparrow. The range expansion of these two species is still in progress today, not so much through continued introduction, but adventitiously by the birds hitch-hiking on board ships and even on aircraft (see Movements), and by natural spread. Involuntary hitch-hiking by House Sparrows is a well established phenomenon. The colonization of the Falkland Islands in 1919 was evidently the result of about twenty individuals of this species travelling aboard four whaling vessels sailing from Montevideo, in Uruguay, to Stanley, in the Falklands. An even more extraordinary trip was taken by a group of House Sparrows that boarded a ship at Bremerhaven, in north Germany, on 14th July 1950 and did not disembark until the ship reached Melbourne, in south-east Australia. In both of these cases, the birds must have been provided with food, but they were not deliberately taken on board.

A second major cause of range extension has been the alteration of the environment. These have involved primarily farming activities that have increased the food resources for these granivores, increasing urbanization, and deforestation that has expanded the habitat favoured by the true sparrows, with their close association with man. These changes have had such an impact that it is worth looking in detail at a few specific examples that illustrate the dynamism of the genus *Passer*.

The spread of the House Sparrow, one of the most sedentary of all wild birds (see Movements), in colonizing new territories at rates of 15–80 km per year has been quite remarkable. Some of this spread, as, for example, that in North America, has no doubt been assisted through translocations by humans, but, even allowing for this, it is still worthy of study as a significant phenomenon in its own right. A recent example is the colonization of Amazonia, in Brazil. The species was introduced in Rio de Janeiro, in south-east Brazil, in 1905. Farther north, it was first recorded in Brasília in 1959 and in Recife in 1963. How it reached these places is not known, but they acted as the two centres from which the species spread to occupy many of the inhabited parts of Amazonia, extending as far west as Manaus, where it was first noted in 1987. Of course, it is not easy, especially in places not commonly visited by interested ornithologists, to distinguish between first occurrences and first reports, but one can assume that the pattern of the spread must have been dependent on deforestation and a growing settled human population. Even more recently, French Guiana was colonized in 1994 and Venezuela in 1996, so the expansion of range is still very much continuing.

A similar recent expansion of the Eurasian Tree Sparrow into the archipelagos of South-east Asia occurred at approximately the same time. Again, the specific details are not known, but the colonization is similarly the result of deliberate introductions, assisted by inadvertent ship-borne immigrants and natural spread. The Eurasian Tree Sparrow has been spreading also in the west of its range, where it has recently colonized Sardinia. The first breeding record on this Mediterranean island was in 1898, the birds either having been deliberately introduced or having arrived as ship-borne immigrants from Naples, on the Italian mainland. Sixty years elapsed with little change and then, within the space of a few years, the sparrows began to spread into coastal towns around the island, displacing the Spanish Sparrow from the built-up environment.

With over 65% of the species in the genus *Passer* associated with man, a greater proportion than in any other passerine genus, it is perhaps not surprising that they have responded strongly to changes in the environment resulting from human activities. In addition to those mentioned above, four other species have shown increases in range and numbers as a result of such effects. The Pegu Sparrow has colonized the Malay Peninsula from Thailand in the last hundred years, massive deforestation having created continuous corridors along which the species has been able to spread. The Dead Sea Sparrow, of which Canon H. B. Tristram once wrote "this bird is the most limited in its range and the scarcity in numbers of individuals", has achieved a significant expansion in its distribution in Israel and Turkey since the 1950s and 1960s. In Israel, at least, this is



*The **Socotra Sparrow** is a restricted-range species, confined to the Socotra Endemic Bird Area. It readily associates with human settlements, and is abundant on the island of Socotra itself, with around 250,000 individuals. In contrast, the paler race* hemileucus, *endemic to the 130-km² island of 'Abd al Kuri, is uncommon, probably numbering only about 1000 birds. This is significant, as it has been found to be genetically divergent from the nominate race, possibly representing a separate species. The Socotra Sparrow is part of a complex of rufous sparrows, nowadays normally considered to constitute six species but sometimes still all treated as conspecific.*

[*Passer insularis insularis*, Socotra. Photo: Hanne & Jens Eriksen]

probably the result of the increase in irrigated land that led to increases along the Jordan River of grasses, particularly canary grasses (*Phalaris*), the seeds of which are the principal food of this sparrow, together with the creation of dead trees, which are its principal nesting site, in areas flooded for fish ponds. Likewise, the Spanish Sparrow has benefited from intensive irrigation and rice cultivation in the valleys of the River Guadiana, in Extremadura, in south-western Spain, and the River Tagus, in southern Portugal. A final major extension of range has been that of the Southern Grey-headed Sparrow into the former Cape Province of South Africa, starting in the 1950s. There is no obvious reason for this spread, but it seems most likely that it is associated with subtle changes in land use and possibly also increasing use of buildings for nesting, as the sparrow has moved into farmland from its original woodland habitat.

In contrast to the range extensions by members of the genus *Passer*, the other genera in this family, and particularly the high-altitude snowfinches and ground-sparrows, whose habitat has been little altered by humans, have shown negligible change in their distribution and numerical status. Nevertheless, the White-winged Snowfinch has benefited from food scraps provided by people during the winter months at ski resorts.

Two species that have suffered minor declines are the Desert Sparrow and the Common Rock-sparrow. The eastern subspecies of the former, *zarudnyi*, has become extinct at the western edge of the Dasht-e-Lut, in Iran, and is decreasing in Turkmenistan and Uzbekistan. The African population in the Sahara, on the other hand, seems to be stable, having recently been rediscovered in Sudan, whence it was originally described and where it was thought to have become extinct. This species is, however, an erratic breeder, populations sometimes disappearing from one area but appearing in another where the species has not previously been reported, making it difficult to determine its true status. The Common Rock-sparrow has lost ground in the north of its range, both in Germany, where it bred regularly up to the 1920s, and in France; a similar trend is apparent on Madeira. These declines are possibly associated with loss of habitat to agriculture. Other possible causes of the rock-sparrow's disappearance from parts of its European range have been suggested. These include, especially, climatic changes, but other contributory factors may have been the direct killing of the birds, for collecting purposes, the restoration of old buildings and the felling of diseased fruit trees.

In the latter part of the twentieth century, however, a major and unexpected change was recorded in the populations of the two most widespread members of the family. A massive decline in the numbers of both the House Sparrow and the Eurasian Tree Sparrow was recorded in the British Isles and the nearby part of mainland Europe from Germany to Belgium. Both of these species had been increasing in farmland since the end of the Second World War. For example, the Eurasian Tree Sparrow, which in Britain is largely restricted to farmland, increased six-fold between the mid-1950s and the mid-1960s. Then, starting in about 1980, the numbers of both species crashed, the Eurasian Tree Sparrow to approximately the same level as that in the 1950s, and the House Sparrow by about 60%. These changes were almost certainly brought about by an increase in cereal production through increased application of chemical fertilizers, followed by the intensification of agricultural practices: the change from spring sowing to autumn sowing of cereals, with the concomitant loss of spilt grain and weed seeds over the winter; increased use of herbicides and pesticides, with a consequent reduction in the invertebrate fauna; more effective harvesting; the disappearance of stack-yards and improved storage, reducing the grain available to the birds; and the change from haymaking to silage production, with the grass cut before it has time to set seed. This has resulted not only in a reduced availability of the seeds that are the main food of the adult sparrows, but also, because of a decreased variety of plants and increased pesticide use, in a reduction in the invertebrates that are essential for the rearing of the young. Over the same period, there was an increase in the population of House Sparrows in the built-up environment, the prime habitat for the species, through increasing urbanization. Then, in about 1990, and independently of the farmland population, a major decline set in, leading to the House Sparrow's virtual extinction in the centre of large conurbations, at any rate in Britain, and a patchy decline in different types of residential areas that still, towards the end of the first decade of the twenty-first century, shows little sign of coming to an stop. A number of factors are probably involved in the urban decline, the major one being a decrease in the availability of invertebrates as a consequence of increased cleanliness and a decrease in the amount of native green vegetation. Although initially the urban House Sparrow decline began in north-western Europe, the same now appears to be occurring in towns in eastern Europe, Israel, India and the USA; and with the Eurasian Tree Sparrow in Japan.



*Another restricted-range member of the rufous sparrow group, the **Cape Verde Sparrow**, or Iago Sparrow, is confined to the Cape Verde Islands, some 5000 km from any of its nearest relatives. While the full specific status of other rufous sparrows is still disputed, the Cape Verde Sparrow has significant morphological and behavioural differences, including distinct sexual dimorphism. It occurs in treeless habitats, and nests in holes in walls and lava cliffs, while other rufous sparrows nest in trees. It is common across most of its range, though sporadic on some smaller islands, and mysteriously absent from the relatively large island of Fogo.*

[*Passer iagoensis*,
Santo Antão,
Cape Verde Is.
Photo: Dick Forsman]



Following its discovery in 1844, the ***Sind Sparrow*** *was not reported for a further 34 years, probably because of confusion with the House Sparrow* (Passer domesticus). *Although it resembles this species quite closely, it is some 20 mm shorter than the sympatric House Sparrow race* indicus. *Although it is a restricted-range species, increased tree-planting along canals and roadsides in the Indus plains has created new habitat, which has enabled the Sind Sparrow to increase significantly in recent years.*

[*Passer pyrrhonotus*, Harayana, India. Photo: Amano Samarpan]

It has been suggested that House Sparrows become adapted to local climatic conditions, and that severe and abrupt departures from these, such as persistent sub-zero temperatures, can cause serious mortality among the population. This certainly seemed to be the case in north-east Spain, when the normally mild winter climate was upset by a very hard winter in 1984–1985, leading to significantly higher mortality.

Despite the fact that the House Sparrow has been placed on the UK Red List of threatened species, is categorized as "Near-threatened" in Germany, and has been given protected status in the Netherlands, this is still a very minor part of the species' population, which on a world scale is under no serious threat and is still extending its range in many parts. This is apparent in the following lines from the Australian John Manifold's poem *Outer Suburbs*:

"It seems that you can't have gracious living and
Goannas. Shiny villas multiply
On what were quite attractive bits of land
And we'll be getting sewerage by and by.

Down where Macpherson's smithy used to stand
They've built a supermarket on the sly.
'It's progress', says my neighbour: 'Things expand'
But living creatures are in short supply.

We haven't had goannas in the yard
For six or seven years. They were the first
To leave, and then the frillies. That was hard.

The only newcomers are oversexed
Damned greedy sparrows, breeding fit to burst.
They drove the wrens away. It's our turn next."



Afghanistan's only endemic bird species, the ***Afghan Ground-sparrow*** *is only known to breed at scattered localities in the mountains, although there is a non-breeding record from Turkmenistan. It occurs in the Band-e-Amir Important Bird Area, which has been declared Afghanistan's first national park, though it still lacks any real management and protection. A potential UNESCO World Heritage Site, Band-e-Amir could provide future revenues from tourism, which would help cement its conservation status, but would need to be strictly controlled if it is not to damage the fragile mountain habitat on which this and other species depend.*

[*Pyrgilauda theresae*, Hazarajat, Afghanistan. Photo: Raffael Ayé/Wildlife Conservation Society]

Conservation measures for the Eurasian Tree Sparrow, in particular the provision of winter food and the erection of nestboxes, appear to have stabilized the situation in Britain, and the species is beginning to show a modest recovery. Nevertheless, there are still many parts of its former range in Britain where it remains an extreme rarity.

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PLATE 48

inches 3
cm 8

Genus *PASSER* Brisson, 1760

1. Saxaul Sparrow

Passer ammodendri

French: Moineau des saxaouls **German**: Saxaulsperling **Spanish**: Gorrión del Saxaul

Taxonomy. *Passer ammodendri* Gould, 1872, Turkestan = Djulek, above Kyzyl Orda, on the Syr Darya, Kazakhstan.

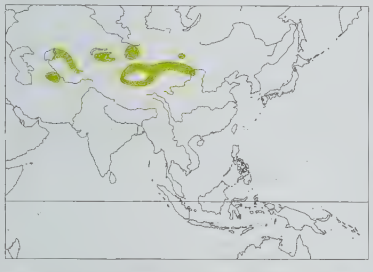
This species suggested as having evolved from an isolated population of sparrows in a steppe region in C Asia that remained unglaciated (25,000–15,000 years ago). Currently occurs in six allopatric populations, relationships among which, and the degree to which they are sufficiently distinctive to justify subspecific separation, are subject to debate. Additional proposed races are *korejewi* (described from E Transcaspia), included within nominate, and *timidus* (from Gobi Desert), subsumed into *stoliczkae*. Three subspecies currently recognized.

Subspecies and Distribution.

P. a. ammodendri Gould, 1872 – S Kazakhstan and N Uzbekistan (Kyzylkum Desert); Turkmenistan (Karakum Desert); possibly NE Iran.

P. a. nigricans Stepanyan, 1961 – SE Kazakhstan (Sary-Ishikotrau Desert), NW China (N Xinjiang) and extreme SW Mongolia.

P. a. stoliczkae Hume, 1874 – China from S Xinjiang (Kashgar and Taklimakan Desert) E to W Inner Mongolia and N Ningxia (Ordos Desert); SC Mongolia (Gobi Desert).



Descriptive notes. 14–16 cm; 25–32 g. Male nominate race has central forehead and crown to nape black, broad white supercilium from in front of eye, becoming tawny behind eye and fanning out on side of neck; lores black, narrow black line behind eye curving downwards around rear of pale grey ear-coverts, cheek paler grey to whitish; upperparts pale sandy grey, mantle with heavy black streaks, median and greater upperwing-coverts tipped white (broad wingbars); black bib from chin to uppermost breast, extending sideways on breast; underparts dirty white; iris dark; bill horn, becoming black in breeding season; legs pale brown or pinky brown. Female has basic pattern similar to that of male, but colours more muted and less contrasting, black areas greyer, tawny colour on head indistinct or absent; generally like a very pale female of *P. domesticus*. Juvenile resembles female, but crown less dark, chin and throat pale, lacking bib. Races differ mainly in plumage. *nigricans* male has blacker and more extensive streaking on mantle and upper back; *stoliczkae* is generally warmer brown above, most of supercilium and area behind ear-coverts gingery brown. Voice. Little reported. Call "cheerp cheerp", softer and more melodious than "chirrup" call of *P. domesticus*; "chip-ip-ip-ip-ip" as threat; alarm a nasal "quer quer", similar to that of *P. domesticus*; flight call "twerp". Song described as being pleasantly melodious, with varying intonation, but not loud.

Habitat. River valleys in sandy or stony desert and semi-desert, particularly associated with saxaul (*Haloxylon*), but found also in poplar (*Populus*) and tamarisk (*Tamarix*); extends into surrounding foothills and into cultivation and isolated habitations or small settlements without trees. Usually near water.

Food and Feeding. Seeds, particularly of saxaul, also insects. Nestlings fed with insects and insect larvae, particularly weevils (Curculionidae), ladybirds (Coccinellidae), grasshoppers (Orthoptera) and caterpillars of Lepidoptera. If water not available, will fly considerable distances several times a day to drink. Forages in mixed flocks with congeners outside breeding season.

Breeding. Season May–Jul; two broods. Nests as isolated pairs or in loose colonies, often mixed with *P. domesticus* and *P. montanus*. Both sexes take part in building nest, a loose construction of grass and rootlets, usually domed, with entrance on side or at top, lined with feathers, wool and fur, placed usually in hole or other hollow in tree, sometimes in nest of bird of prey, earth bank, wall or isolated building, these other sites probably now more frequently used owing to increasing removal of large trees by local inhabitants. Clutch 4–6 eggs; incubation by female, period 12–14 days; chicks fed by both parents, nestling period 13–15 days.

Movements. Mainly sedentary; flocks may make small local movements outside breeding season. Some populations possibly winter S of breeding range, but remain in desert regions.

Status and Conservation. Not globally threatened. Status poorly known; spends much time in foliage of bushes or trees, making it difficult to see. Some suggestion of range contraction, probably because of increased penetration by humans into semi-desert regions with irrigation. Claimed presence in non-breeding season in mountains of Iran–Afghanistan border requires corroboration; record from NE Iran in Apr 2004 suggests possible breeding. Owing to its sporadic distribution and desert habitat, this species presents little threat to agriculture.

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2. House Sparrow

Passer domesticus

French: Moineau domestique **German**: Haussperling **Spanish**: Gorrión Común
Other common names: Indian/Ceylon House Sparrow (*indicus*)

Taxonomy. *Fringilla domestica* Linnaeus, 1758, Sweden.

Presumed to have evolved from sparrow population that was trapped in Middle East during last Pleistocene glaciation (25,000–15,000 years ago). Forms a superspecies with *P. italiae* and *P. hispaniolensis*, and the three sometimes considered conspecific. Hybridizes with former in N Italy and with latter in SE Europe (Balkans), NW Africa, and Cape Verde Is (on São Vicente, where introduced), and evidently with *P. castanopterus* in Somalia; hybrids with *P. montanus* regularly reported, particularly where one of the two species rare and presumably has difficulty in finding a mate of its own species. Races form two groups, "nominate (or Palearctic) group" (also with *balearoibericus*, *tingitanus*, *niloticus*, *biblicus* and *persicus*) and "*indicus* (or Oriental) group" (also incorporating *rufidorsalis*, *hyrcanus*, *hufufae*, *bactrianus* and *parkini*), these groups intergrading where ranges meet. Migratory race *bactrianus* of the "*indicus*-group", and hence *indicus* itself, considered by some authorities worthy of full species rank, largely on grounds that it does not interbreed with resident nominate race (which has spread to C Asia in the last century) as well as differences in morphology and ecology; this, however, seems unsustainable as *indicus* intergrades with *persicus*, clearly a member of "nominate group"; lack of interbreeding seems more probably a temporal than a genetic effect. In North America, where introduced, birds from W USA described as race *plecticus*, supposedly paler than nominate, but differences apparently clinal; proposed race *maroccanus* (from Morocco) is synonymized with *tingitanus*. Nomenclature of introduced populations problematic, as many have differentiated sufficiently to be subspecifically separated from the parent stock; this certainly the case in North America, and also in S Africa (where some populations are derived from introduction of *indicus* from India that have interbred with smaller inoculum of nominate from Europe), and will obviously become an increasing problem as other introduced populations diverge. Twelve subspecies recognized.

Subspecies and Distribution.

P. d. domesticus (Linnaeus, 1758) – N & W Europe (S to Iberia and SC France) E in NC Asia (S to Ukraine, N Mongolia and NE China) to mouth of R Amur, locally also Sakhalin I and W & E Kamchatka.

P. d. balearoibericus Jordans, 1923 – Balearic Is, and S France E (excluding Italy and most Mediterranean islands) to WC Asia Minor.

P. d. tingitanus Loche, 1867 – NW Africa (Morocco E to NE Libya).

P. d. niloticus Nicoll & Bonhote, 1909 – Egypt (Nile Delta and Nile Valley).

P. d. biblicus E. J. O. Hartert, 1904 – SE Turkey, Cyprus and Levant E to NW Iran.

P. d. persicus Zarudny & Kudashev, 1916 – C Iran (S of Elburz Mts) E to W & S Afghanistan.

P. d. hyrcanus Zarudny & Kudashev, 1916 – SE Azerbaijan and N Iran (N of Elburz Mts).

P. d. indicus Jardine & Selby, 1831 – S Israel, S Palestine and much of Arabia E to SE Iran, peninsular India, Sri Lanka and C SE Asia (E to Laos).

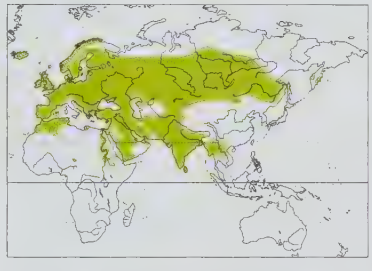
P. d. rufidorsalis C. L. Brehm, 1855 – Sudan (Nile Valley S to 13° N) and E to Red Sea coast in Eritrea.

P. d. hufufae Ticehurst & Cheesman, 1924 – E Arabian Peninsula.

P. d. bactrianus Zarudny & Kudashev, 1916 – W Turkmenistan, NE Iran and S Kazakhstan E to Tien Shan, extreme NW China (NW Xinjiang) and NW Pakistan.

P. d. parkini Whistler, 1920 – from Kashmir E to Nepal.

Introduced (mainly nominate race and, in South Africa, *indicus*) in most other inhabited parts of the world, including the Americas and Australasia.



Descriptive notes. 16–18 cm, 20–39 g ("nominate group"); 14–16·5 cm, 21–33 g ("*indicus* group"). Very well-known species, those in urban environments tending to have dull, unkempt appearance, in contrast to those living in rural areas, which are quite striking and with more contrasts in plumage. Male nominate race breeding has characteristic head pattern, with grey crown, black line from bill back to eye, small white postocular spot (sometimes lacking), chestnut band behind eye and across nape and back of head, pale grey ear-coverts, and white or whitish cheek; upperparts brown, streaked black, lower back to uppertail-coverts brownish-grey; lesser and median upperwing-coverts chestnut, medians broadly tipped white, greater coverts dark brown to blackish-brown with broad chestnut edges and narrow buffish tips; flight-feathers blackish, secondaries and tertials edged pale brown, small pale patch at base of primaries; tail dark brown to blackish-brown, feathers with narrow buffish edges; chin and throat black, black extending variable distance onto breast and side and breast (black bib becomes more extensive in breeding plumage through abrasion of feather tips); otherwise pale grey below; iris dark brown; bill black; legs brown or dark brown. Non-breeding male differs from breeding in having chestnut colour of nape and most of black bib obscured by greyish feather tips, bill horn-coloured. Female is mainly dull brown, with lighter superciliary stripe, upperparts similar in pattern to male's but duller, lacking chestnut tones; chin and throat whitish (lacks dark bib), underparts paler; bill brownish, yellower base. Juvenile is like female, young male with hint of greyish bib. Races differ mainly in plumage tones, also in size, those in "*indicus* group" less robust and clearly smaller than those in "nominate group", as illustrated by e.g. mean wing length (male nominate 75·7 mm in England, 78·9 mm and 82·6 mm for two populations in N Germany): *balearoibericus* is generally paler than nominate, male cheek lighter grey, chestnut of nape and wing more cinnamon, grey of crown, lower back and rump paler (male wing c. 78 mm); *tingitanus* is similar to previous, but with black streaking on crown that becomes almost black with wear (male wing 78·8 mm); *biblicus* is paler than nominate (male wing 81 mm); *niloticus* is similar to last, but paler and smaller (male wing 75 mm); *persicus* also is similar, but paler (male wing 78·7 mm); *indicus* differs from nominate in strikingly white cheeks and very pale (almost white) underparts, chestnut of back paler, accentuating contrast of black streaks (male wing 74·4 mm); *rufidorsalis* has chestnut areas brighter and more extensive than last (male wing 72 mm); *hyrcanus* has chestnut areas darker, crown streaked (male wing 76·7 mm); *bactrianus* is paler than previous (male wing 76·1 mm); *parkini* has chestnut areas richer and darker than last (male wing 79·5 mm); *hufufae* is paler and greyer, chestnut pigments reduced (male wing c. 73·5 mm). Voice. Commonest vocalization a disyllabic "chirrup", used by male at nest-site to indicate ownership, and also by unmated male to attract a female, when a series of "chirrup" calls strung together to form rudimentary song (accompanied by wing-shivering). Threat indicated by "churr" followed by higher-pitched chatter or rattle; this gradually transformed to a more nasal "tew" as mood changes from threat to alarm. Soft "dee" used in solicitation between mates, and between adults and young. Individuals frequently gather in deep cover after feeding bout and join together in quiet, conversational chirping notes ("social song"); same heard at communal roost, this time less conversational-sounding and interspersed with threat and alarm calls as birds dispute favoured perch.

Habitat. Primarily associated with man, living around buildings from isolated farms to urban centres, showing preference for suburbs (where occurs at greater density and has greater breeding

On following pages: 3. Italian Sparrow (*Passer italiae*); 4. Spanish Sparrow (*Passer hispaniolensis*); 5. Sind Sparrow (*Passer pyrrhonotus*); 6. Somali Sparrow (*Passer castanopterus*); 7. Russet Sparrow (*Passer rutilans*); 8. Pegu Sparrow (*Passer flaveolus*); 9. Dead Sea Sparrow (*Passer moabiticus*).

success than in city centres and more rural areas). In S of range more frequently in open country, and has been recorded as breeding in small isolated colonies away from humans in Arabian Peninsula (also in Riverina District of New South Wales, in Australia, where introduced). In C Asian republics and Afghanistan, where mainly a summer visitor, confined to open country in area of overlap with resident *P. montanus* (latter having already occupied built-up habitat before arrival of present species); farther N, in Siberia, the two species live side by side in built-up areas. Lowlands to mountains; to 2300 m in Europe and to 4600 m in Himalayas; one record at 4900 m, in Peru, where introduced.

Food and Feeding. Mainly vegetable matter, especially seeds of grasses, cultivated cereals and low herbs, but also buds, berries and wide range of household scraps. Some animal matter taken, making up to 10% of diet in summer months. Is, however, a complete opportunist and takes very wide range of food items, including small frogs, small molluscs and crustaceans on shoreline. Nestlings fed for first three days with animal food, mainly aphids (Aphidoidea), weevils (Curculionidae), grasshoppers (Orthoptera) and caterpillars, later gradually changing to vegetable diet. Seeds collected from growing plants and from the ground. Catches arthropods by searching for them, although occasionally takes larger insects, such as butterflies (Lepidoptera), in flight, and dragonflies (Odonata) seized at rest when in semi-torpid state in cool early morning. Generally in flocks, often large ones outside breeding season.

Breeding. Feb–Sept, varying with latitude, but can be interrupted by high temperature and monsoon rains; up to three broods, and occasionally four. Field observations suggest strict monogamy, but DNA studies have shown that 10–20% of nestlings were not fathered by male of the pair feeding the young. Breeds mainly in loose colonies of 10–20 pairs, sometimes more; occasionally solitary. Nest-building started by unmated male, but once pair formed the female takes part, particularly in adding lining; nest consists mainly of plant stems, lined with feathers or other soft material, preferred site a hole in building, cliff or tree (material then filling cavity), but sometimes, particularly in S of range, in branches of tree (nest then about size of a football, domed, with entrance on side), and migratory populations in Asia breed away from man in hole in cliff or earth bank; is, however, extremely catholic in choice of site, and has been recorded as nesting on moving structures, such as nodding donkey in oil field, and even on moving vehicles e.g. car and small ship (the pair following these on their daily journeys and continuing to feed nestlings), and even lived and nested 640 m below ground in coal mine in England. Clutch 2–5 eggs, occasionally up to 8; incubation by both sexes, period 11–14 days; chicks fed by both sexes, nestling period 14–16 days; fledglings fed by both parents for up to c. 2 weeks. Overall breeding success from 33 studies was 48·5% (range 25–85%); most pairs raise about five young per year. One ringed individual lived for at least 13 years in the wild; mean annual survival rate in Europe 54%.

Movements. Mostly resident; some limited withdrawal of populations breeding at high latitudes and altitudes to less cold areas in winter. Small amount of juvenile dispersal in autumn; once individuals have settled in breeding area, they stay mainly within small range of 1–2 km in radius. Races *bactrianus* and *parkini* migratory, former spending non-breeding season in N parts of Indian peninsula, latter moving S to lower altitudes.

Status and Conservation. Not globally threatened. Generally common to abundant; one of the commonest passerines, natural range having been increased by introductions in most inhabited parts of the world. Breeding densities range from 2–5 pairs/ha at town edges to as high as 25 pairs/ha in farms with livestock, although marked decline in recent years in some areas. Rough estimates in 1980s–1990s gave following figures for breeding pairs: Russia 30,000,000, Spain 9,500,000, Germany 6,500,000 (5,600,000–11,000,000 in 2006), Belarus 5,500,000, Czech Republic 4,000,000, Ukraine 3,500,000, Bulgaria, Romania, Croatia and Turkey each 3,000,000, Slovakia 1,500,000, with European total of over 50,000,000 breeding pairs and perhaps a world population of c. 500,000,000 pairs. Since c. 1980, numbers have declined significantly in the highly developed parts of W Europe and North America (introduced), particularly in large urban centres (decreases of up to 95%) and farmland (decrease of c. 70%); for example, estimated breeding population in Britain in 2000 between 2,000,000 and 5,400,000 pairs, a reduction of 60–65% from the peak in c. 1980. As a result of decline, this species was red-listed in UK in 2002 and listed as "Near-threatened" in Germany, though still common despite this decline. Recent studies in Britain suggest that major reason for decline is decreasing availability of suitable vertebrate food necessary for rearing young, and possibly reduced fitness of those young that fledge successfully; has been proposed also that the conservation and habitat enhancement of even the smallest parks and gardens are likely key factors in addressing the decline of this species in many cities. More recently, evidence of decline in urban populations noted also farther E in range, in Ukraine and India. On the other hand, is still expanding its range in some areas, with spread S in Kazakhstan and Siberia, increasing reports from Thailand, and recent records from Japan (1990), Hong Kong (1994) and Seychelles (2004); further, has extended range S along R Nile in Sudan and spread E through Eritrea to Red Sea coast (at Massawa), and has established breeding populations in W Africa, where introduced, originating in Senegal (1970s) and now thinly distributed, mainly in coastal towns, from Mauritania S to Ivory Coast, also inland at L Chad; also in French Guiana (1994), Venezuela (1996), where at present restricted to coastal strip N of N Cordilleras, and Singapore (1997); in Canary Is, on Gran Canaria (1998), but these birds have now disappeared, presumably having been absorbed into local population of *P. hispaniolensis* through hybridization.

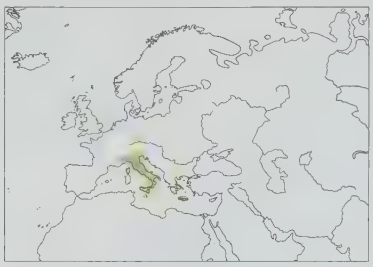
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3. Italian Sparrow

Passer italiae

French: Moineau cisalpin **German**: Italiensperling **Spanish**: Gorrión Italiano
Other common names: Cisalpine Sparrow

Taxonomy. *Fringilla Italiae* Vieillot, 1817, Italy.
Forms a superspecies with *P. domesticus* and *P. hispaniolensis*, and the three sometimes considered conspecific. Hybridizes with former in N of range (along the line of the Alps) and with latter in S (rather broader zone S of Naples, possibly extending as far S as Malta and even Pantelleria). Has been treated variously as a race of one or other of those, as a stabilized hybrid between them, and as an independent species of N African origin that subsequently spread to Italy and became extinct in N African area of its origin. Appears distinctive in plumage, and treatment as distinct species based on argument that speciation of animals can occur only through geographical isolation, and not by hybridization. Although hybridization hypothesis plausible, and while origin remains uncertain, this taxon is most conveniently treated, as is currently common practice, as a separate species on grounds that population is stable and has resulted from events long past. Populations in Corsica, Sicily and Crete phenotypically similar to present species and included within it. Monotypic.
Distribution. Italy, Corsica, Sicily and Crete.



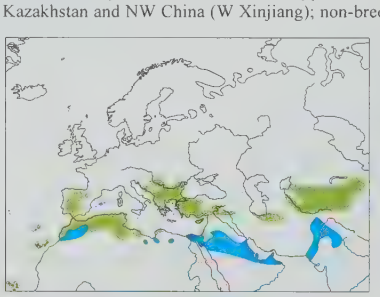
Descriptive notes. c. 16 cm; 23–30 g. Male is intermediate in plumage between *P. domesticus* and *P. hispaniolensis*: has chestnut crown, nape and hindneck, black lores, white cheek and ear-coverts; warm brown upperparts streaked black, lower back to uppertail-coverts grey; upperwing-coverts dark brown with broad chestnut edges, medians broadly tipped white, greaters with narrow buffish tips, flight-feathers blackish with broad buff edges; rectrices grey-brown with buffish edges; chin and throat to upper breast black (bib limited in extent, slightly larger than that of *P. domesticus*), rest of underparts pale whitish-grey; iris dark brown; bill black; legs flesh-pink to horn-brown. Female is mainly dull brown, with indistinct paler supercilium, upperparts as on male but duller, lacking chestnut, underside whitish to buffy white (lacks dark bib), bill browner; indistinguishable from female *P. domesticus*. Juvenile is like female. Voice. Disyllabic "chirreep" call used by male to proclaim nest-site ownership and in speeded-up version to attract a mate, more melodic than similar call of *P. domesticus* and more akin to that of *P. hispaniolensis*; suggested as better adapted to "natural" environments than to noisy "urban" ones. Other calls very similar to those of *P. domesticus* and *P. hispaniolensis*.
Habitat. Urban areas, farms and villages, including surrounding land, with preference for rocky habitats. Similar to that of *P. domesticus*, although probably less at home in urban areas, particularly well-vegetated ones (where it co-exists with and appears to be subdominant to *P. montanus*), and more in agricultural areas with extensive cereal cultivation. Unlike *P. domesticus*, occurs also in light woodland. Lowlands to 2200 m.
Food and Feeding. Principally seeds in agricultural areas, and domestic scraps near habitations; also some animal food, mainly insects, and small lizards regularly noted as being taken. Young fed with insects, mainly beetles (Coleoptera) and larvae of Lepidoptera, and seeds. Forages in small flocks.
Breeding. Not well recorded. Mar–Aug, mainly May–Jun; one or two broods, rarely up to four; appears to have shorter breeding season than *P. domesticus* and *P. hispaniolensis*. Breeds usually in loose colonies. Nest an untidy mass of dry grass, more compact than that of *P. domesticus*, domed, with entrance at side, lined with feathers; placed usually in hole in tree, building or rocky coastal cliff, or in base of nest of bird of prey, sometimes more openly in tree, e.g. at base of leaves of palm, or free-standing in branches of tree or on telegraph pole. Clutch 2–8 eggs, mostly 4–6; incubation by both sexes, period 11–15 days; chicks fed by both parents, nestling period 11–17 days; fledglings fed by both parents.
Movements. Largely sedentary; recovery in Italy of individuals ringed in S France (Camargue) and recovery on Corsica of one ringed on Italian mainland suggest that there can be significant dispersal.
Status and Conservation. Not globally threatened. Abundant; the most numerous bird species in Italy. Breeding densities 2–40 birds/10 ha; estimated population of 5,000,000–10,000,000 breeding pairs. Apparent decline noted recently, especially in urban areas.
Bibliography. Baumgart (2003), Brichetti (2008), Brichetti *et al.* (1993), Cramp & Perrins (1994), Dinetti (2006, 2007, 2008), Fulgione & Milone (1998), Fulgione, Aprea *et al.* (2000), Fulgione, Esposito *et al.* (2000), Fulgione, Procaccini & Milone (2000), Fulgione, Rippa *et al.* (2005), Fulgione, Ruschi *et al.* (1998), Hagemeijer & Blair (1997), Hartert (1904), Hudde (1997b), Johnston (1969), Lo Valvo & Lo Verde (1987), Lockley (1996), Massa (1989), McCarthy (2006), Meschini & Frugis (1993), Milone *et al.* (2002), Sorace (1993), Summers-Smith (1988), Thibault & Bonacorssi (1999), Töpfer (2006).

4. Spanish Sparrow

Passer hispaniolensis

French: Moineau espagnol **German**: Weidensperling **Spanish**: Gorrión Moruno
Other common names: Willow Sparrow

Taxonomy. *Fringilla hispaniolensis* Temminck, 1820, Algeciras, southern Spain.
Forms a superspecies with *P. domesticus* and *P. italiae*, and the three sometimes considered conspecific. Hybridizes extensively with former, and in S Italy with latter; hybrids with *P. montanus* also reported. Two subspecies recognized.
Subspecies and Distribution.
P. h. hispaniolensis (Temminck, 1820) – Iberian Peninsula, Sardinia, Greece and Balkans, W Asia Minor, E Atlantic islands (Madeira, Canary Is and Cape Verde Is) and NW Africa (Morocco E to NE Libya).
P. h. transcaspicus Tschusi, 1902 – Cyprus, E Turkey and Levant E to Iran, Afghanistan, S Kazakhstan and NW China (W Xinjiang); non-breeding also NW Indian Subcontinent.



Descriptive notes. 15–16 cm; 22–38 g. Male nominate race breeding has forehead to nape and hindneck deep chestnut, lores black (usually with short white supraloral line), white postocular spot, cheek and ear-coverts; upperparts streaked black and buffish-brown, paler line down each side of mantle and back, lower back to uppertail-coverts greyish-brown; upperwing-coverts chestnut, medians broadly tipped white, greaters with black centres and narrow whitish tips, flight-feathers black, edged sandy, pale patch at base of primaries; tail dark brown, bases of rectrices edged paler; chin to breast black, black continuing as heavy bold streaks down side to lower flanks (extent of streaking variable), rest of

underparts white; iris dark brown; bill black; legs pale pale pinkish or fleshy-brown. Differs from similar *P. domesticus* in having top of head chestnut (not grey), white postocular spot always present (not sometimes lacking), upperparts more boldly marked, and bib more extensive and continued on flanks as black streaks. Non-breeding male differs from breeding in having chestnut and black areas of head and much of black bib obscured by greyish feather tips, black areas on upperparts likewise, bill horn-coloured. Female is mainly dull brown to grey-brown, with lighter superciliary stripe (mainly behind eye), upperparts similar in pattern to male's but duller and browner, with less black and lacking chestnut tones (but normally rather more boldly marked than *P. domesticus*, although often inseparable in field); chin and throat whitish (lacks dark bib), underparts paler, with necklace of dark streaks that are continued down flanks; bill brownish, yellower base. Juvenile is similar to female, but markings somewhat less bold, and lacks necklace and streaks below; often inseparable in field from juvenile of *P. domesticus*. Race *transcaspicus* is very like nominate, and male almost identical, but freshly moulted individuals (particularly females) paler. VOICE. Call an almost disyllabic "tchweep", used by male to proclaim nest ownership, speeded up into continuous flow of rapidly repeated "cheeli-cheeli-cheeli" calls to attract a mate, louder and higher-pitched than similar calls of *P. domesticus*; can be heard at distance of up to several hundred metres. A similar, but softer call given at roost, when large numbers that collect together can produce quite a din. All other calls similar to those of *P. domesticus*, include conversational jumble of soft chirps in "social singing", nasal "chur-it-it-it" as threat, nasal "quer" or "quer-it-it" as alarm, "que que que" for contact.

Habitat. Predominantly moist, humid areas near water with trees and shrubs; normally associated with cultivation, extending in places into more arid steppe and semi-desert and penetrating urban areas where *P. domesticus* is lacking, e.g. Malta, Sardinia, Madeira, Canary Is. Outside breeding season frequently associates with *P. domesticus* in open areas, but is more nomadic than its congener. Normally in lowlands, but to 2750 m in Afghanistan.

Food and Feeding. Principally vegetable matter, mainly seeds of grasses, cultivated crops and low herbs, but invertebrates taken throughout year. Insects eaten are mainly caterpillars (of Lepidoptera), grasshoppers (Orthoptera) and flying ants (Formicidae); beetles (Coleoptera) apparently less important than for *P. domesticus*. Chicks fed almost exclusively with insects for first half of nestling period, followed by increasing proportion of plant material. May capture insects by searching on ground or among leaves of bushes and trees. Generally in small to large flocks.

Breeding. Season mainly Apr–Aug in W of range, from Mar in N Africa, and Aug–Oct and Feb–Mar in Cape Verde Is; in E of range moves N (following 25°C Jul isotherm) for successive broods, breeding from end May/early Jun in NE of range; 2–4 broods. Colonial, in W of range colonies of tens to several thousands, with up to c. 125,000 nests in one colony distributed over 60 ha in Morocco, generally even larger in E, with colonies of up to several hundred thousand pairs; nests packed closely together, sometimes over 100 in one tree. Nest built by both sexes, a loosely woven, roughly spherical structure 15–30 cm in diameter, of grass and other plant stems, lined with finer grasses and feathers, firmly attached to branches of tree, in lower part of large nest of bird of prey, crow (Corvidae) or heron (Ardeidae), or on pylon; much less commonly in hole in wall or building, such sites used particularly where *P. domesticus* absent. Clutch 2–6 eggs, occasionally up to 8; incubation by both sexes, period 11–14 days; chicks fed by both parents, nestling period 11–15 days; fledglings tended by both parents. Breeding success for individual nests estimated at 53–62%, but because of breeding strategy no data on annual productivity. Ringed individual survived for at least 9 years in the wild.

Movements. Variously resident, nomadic and migratory. Those on E Atlantic islands and some populations in S of range resident; partial shift S, e.g. in Ibera and NW Africa. In E, race *transcaspicus* mostly migratory, after breeding moving to S Afghanistan, Pakistan and NW India, some to Arabian Peninsula; arrives in Kazakhstan from mid-Apr to early Jun, leaving from late Sept to early Nov; vast numbers on passage through passes of W Tien Shan. In addition, dispersal by post-breeding flocks in search of food can involve distances of several hundred kilometres. Vagrants recorded in British Is and N Europe and, in S, accidental in winter S to 19° N in Morocco, S Saharan oases and N Sudan.

Status and Conservation. Not globally threatened. Common to locally abundant. Rough estimates in 1980s–1990s gave following figures for breeding pairs: Romania 500,000, Greece 400,000, Bulgaria 300,000, Malta 40,000, Spain and Portugal 30,000 each, with total for Europe of 1,500,000–2,500,000 pairs; several tens of thousands of pairs in Israel. Few population figures for E part of range, but extremely numerous in some areas; numbers migrating through Chokpak Pass, Kazakhstan, declined from average 35,200,000 in 1965–1981 to 11,400,000 in 2003–2005. Colonized Madeira, Canary Is and Cape Verde Is in 19th and 20th centuries; in SE Kazakhstan and NW China (Xinjiang), has extended range since 1940 as a result of increase in cereal cultivation. Increase in numbers and distribution noted since 1980 in Iberian Peninsula (Extremadura, in Spain; Alentejo, in Portugal), in Balkans, and in Middle East (where it has extended S to Saudi Arabia), and further increase also in extreme NE of range in Xinjiang, despite extensive attempts at control by local farmers; this increase and expansion largely the result of intensification of irrigated cultivation. In contrast, has declined almost to extinction on Madeira as a consequence of indiscriminate use of insecticides. Where its numbers are large, this species can become a serious pest of agriculture.

Bibliography. Bachkiroff (1953), Baumgart (1980, 1984, 2003), Cheng Tsohsin (1987), Clement *et al.* (1993), Cramp & Perrins (1994), Dinetti (2008), Elias (1996), Elias & Moore (2003), Fry & Keith (2004), Gavrilov (1962a, 1962b, 1963), Gavrilov & Gavrilov (2005), Gistov & Gavrilov (1984), Hagemeijer & Blair (1997), Hartert (1904), Hudde (1997b), Johnston (1969), Kirwan *et al.* (2008), Makatsch (1955), McCarthy (2006), Martí & del Moral (2003), Meadows (2003), Metzmacher (1984, 1986a, 1986b, 1986c, 1986d, 1989, 1990), Mirza (1974), Patrikeev (2004), Pinowski & Kendeigh (1977), Purroy (1997), Riss (1989), Roberts (1992), Roviralta Peña (2003), Sacarrão & Soares (1975), Stepanyan (2003), Summers-Smith (1988), Thévenot *et al.* (2003).

5. Sind Sparrow

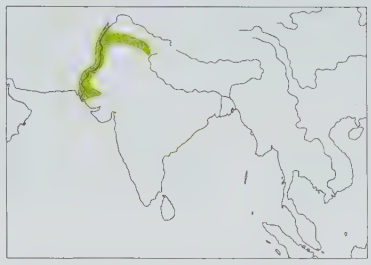
Passer pyrrhonotus

French: Moineau du Sind **German**: Dschungelsperling **Spanish**: Gorrión del Sind
Other common names: (Sind) Jungle/Rufous-backed Sparrow

Taxonomy. *Passer pyrrhonotus* Blyth, 1845, Bahawalpur, Sind, Pakistan.
Thought probably to have evolved from a population of sparrows trapped in Indus Valley, which remained ice-free during last Pleistocene glaciation (25,000–15,000 years ago). Was in the past believed to be possibly a small race of *P. domesticus*. Monotypic.

Distribution. Indus Valley (and lower reaches of its main tributaries), in Pakistan, E in Punjab to Delhi area, in N India.

Descriptive notes. 12·5–13 cm. Male breeding has grey crown to hindneck, dirty grey ear-coverts and cheek, black lores, broad chestnut band behind eye curving around rear of ear-coverts and broadening on lower neck side; mantle and back upperparts rich brown, streaked black, scapulars chestnut with black centres, rump plain reddish-brown, uppertail-coverts grey; lesser upperwing-coverts chestnut, medians black with broad white tips, greater coverts blackish with broad brown-



ish edges and narrow buff tips; flight-feathers black, edged buffish to sandy, small buff area at base of primaries; tail greyish-brown, feathers finely edged buffish; chin and centre of throat to uppermost breast black, side of throat white, underparts pale grey, flanks washed light brownish, undertail-coverts whiter; iris dark brown; bill black; legs yellowish-brown. Differs from similar *P. domesticus* in smaller size, greyer ear-coverts, more distinct black streaking on back, reddish-brown rump, more restricted bib. Non-breeding male differs from breeding in having pattern somewhat obscured by greyish feather tips, bill base paler, horn-coloured. Female is mainly dull brownish, with lighter superciliary stripe, upperparts similar in pattern to male's but duller, chin and throat plain light greyish (lacks dark bib), underparts paler; bill brownish, yellower base; very like a small sleek female *P. domesticus*. Juvenile resembles female. VOICE. Poorly known. Male call a soft "chup". Song described as mix of whistles, chirrups, twitters and grating notes, more complex than that of *P. domesticus*; old report that song consists of the usual sparrow chirrups, but with a sharper note, often repeated, which resembles call of White Wagtail (*Motacilla alba*).

Habitat. Predominantly in riverine or swampy areas, occurring in wet tall grass, tamarisk (*Tamarix*) and acacia (*Acacia*) jungle; unlike majority of sparrows, is not particularly associated with humans.

Food and Feeding. Mainly seeds, mostly of grasses and small herbs; also some invertebrate food, e.g. caterpillars of Lepidoptera. Forages in small flocks, of up to c. 20 individuals outside breeding season.

Breeding. Season Apr–Sept; two broods. Breeds in loose colonies. Nest a large, untidy globular construction of grass, reeds and coarse twigs, entrance on side or at top, placed in branches of low tree, particularly one standing in or overhanging water. Clutch 3–5 eggs. No other information available.

Movements. Resident. Report of "small *P. domesticus* with a characteristic high-pitched call" in E United Arab Emirates (Al Fujayrah) in Nov 2000 suggests possible S movement outside breeding season, but confirmation required.

Status and Conservation. Not globally threatened. Restricted-range species: present in Indus Plains Secondary Area. Locally common. Expansion E in N India relatively recent. Old reports from SE Iran (Sistan) require corroboration. Following initial discovery of the species, and despite considerable searching, 34 years elapsed before it was found again; this probably due to fact that its similarity to *P. domesticus* suggested that it was merely a small race of latter.

Bibliography. Ali & Ripley (1974), Bapat (1992), Clement *et al.* (1993), Currie (1909), Doig (1880), Harvey & Sharma (2002), Holmes & Wright (1969), Hume (1873, 1880), Rasmussen & Anderton (2005b), Roberts (1992), Scott *et al.* (1975), Summers-Smith (1988), Ticehurst (1922), Whistler (1911), Whistler & Kinnear (1949).

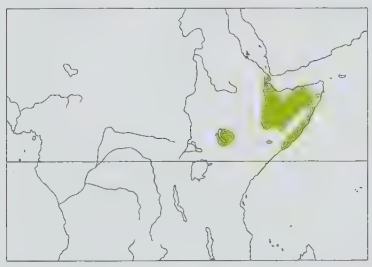
6. Somali Sparrow

Passer castanopterus

French: Moineau de Somalie **German**: Somalisperling **Spanish**: Gorrión Somalí

Taxonomy. *Passer castanopterus* Blyth, 1855, Somalia.
Has been considered to form a superspecies with *P. rutilans*, and sometimes treated as conspecific; similarities in plumage and morphology between the two likely a matter of convergence, rather than close relationship. Two subspecies recognized.

Subspecies and Distribution.
P. c. castanopterus Blyth, 1855 – Djibouti, Somalia and E Ethiopia (E from c. 41° E).
P. c. fulgens Friedmann, 1931 – extreme S Ethiopia and N Kenya (S to Kapedo and Marsabit).



Descriptive notes. 13–14 cm; c. 18 g. Male nominate race breeding has forehead to hindneck bright chestnut, lores and small area behind eye black, ear-coverts and cheek pale creamy grey; upperparts grey, mantle and back heavily streaked black; upperwing-coverts and most of scapulars bright chestnut, flight-feathers blackish, secondaries and tertials edged buffish, small creamy patch at base of primaries; tail dark grey, feathers edged brownish; chin and throat to uppermost breast black; underparts off-white to pale buffy grey; iris dark brown; bill black; legs pale brown to pinkish-brown. Non-breeding male differs from breeding in having plumage slightly obscured by whitish feather tips, bill horn-coloured. Female is mostly dull brown, lacking chestnut, with broad pale creamy supercilium, sandy-brown upperparts with some black streaking, wing much as for male, chin and throat white, underparts light buffish, bill yellowish with brown tip. Juvenile is like female, but paler. Race *fulgens* has chestnut of head brighter, strong yellow wash on cheeks and underparts. VOICE. Poorly known. Call a soft "chirrup", almost identical with that of *P. domesticus*.

Habitat. Semi-arid to arid country with acacias (*Acacia*), and frequently in towns and villages, where it takes over role of *P. domesticus*; also rocky areas, including coastal cliffs.

Food and Feeding. Mainly granivorous, food including seeds of cultivated cereals, and has been recorded as feeding on spilt grain and on undigested grain in droppings from horses; also household scraps; also insects, e.g. termites (Isoptera) and caterpillars of Lepidoptera. Gregarious; outside breeding season forages in large flocks.

Breeding. Season Feb–Jul. Solitary or in loose colonies; sometimes in colonies of *P. euchlorus*. Open nest flask-shaped, loosely constructed from grass, lined with feathers, placed in hole in building or in branches of thorny tree or shrub. Clutch 4–7 eggs; young fed by both sexes. No other information.

Movements. Nomadic in large roaming flocks outside breeding season.

Status and Conservation. Not globally threatened. Uncommon to rare in Djibouti; locally common elsewhere in range. Very common, at least formerly, in Somalia; present status there not known, but possibly increasing. Rare in parts of Kenyan range. Opportunistic; spread inland in Somalia in early 1900s following the supply convoys of British army, feeding on scraps and grain spilt by the baggage animals, and more recently has exploited famine-relief centres. Nomadic post-breeding flocks can become sufficiently large to be a pest in cereal cultivation.

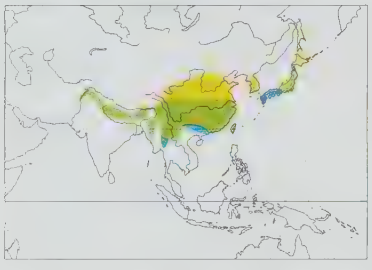
Bibliography. Archer & Godman (1961), Ash & Atkins (2009), Ash & Colston (1981), Ash & Miskell (1998), Britton (1980), Clement *et al.* (1993), Friedmann (1931, 1937), Fry & Keith (2004), Lewis (1981b), Mackworth-Praed & Grant (1960), McCarthy (2006), Redman *et al.* (2009), Ruelle (1992a), Summers-Smith (1988), Witherby (1905).

7. Russet Sparrow

Passer rutilans

French: Moineau rutilant **German**: Rötelsperling **Spanish**: Gorrión Rutilante
Other common names: Cinnamon (Tree) Sparrow, Ruddy Sparrow

Taxonomy. *Fringilla rutilans* Temminck, 1836, Japan.
This species probably evolved from an isolated sparrow population that was trapped in an ice-free refugium in Yangtze Valley during the last Pleistocene glaciation (25,000–15,000 years ago). Has been considered to form a superspecies with *P. castanopterus*, and sometimes treated as conspecific; similarities in plumage and morphology between the two likely a matter of convergence, rather than close relationship. Proposed race *batangensis* (described from W Batang area of Sichuan, in China) considered synonymous with *intensior*. Three subspecies recognized.
Subspecies and Distribution.
P. r. cinnamomeus (Gould, 1836) – NE Afghanistan E in Himalayas (mostly above 1800 m) to S China (S & SE Xizang and S Qinghai) and NE India (Arunchal Pradesh).
P. r. intensior Rothschild, 1922 – NE India (Assam), SC & S China, and N Myanmar E to N Laos and NW Vietnam.
P. r. rutilans (Temminck, 1836) – NC & E China, Korea, Taiwan, S Sakhalin I, S Kuril Is and Japan.



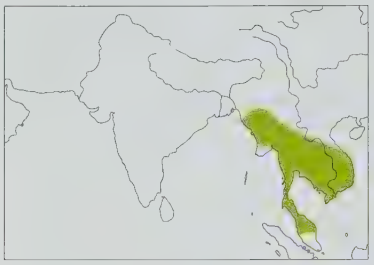
Descriptive notes. 14–15 cm; 13–23 g. Male nominate race breeding has top of head to hindneck and upperparts bright cinnamon-brown or russet, heavily streaked black on mantle; lores black, ear-coverts and cheek off-white; lesser upperwing-coverts as back, median coverts black with broad white tips, greaters blackish with broad buffish edges and narrow pale buff tips; flight-feathers blackish, secondaries and tertials edged buffish, small pale patch at base of primaries; tail dull brownish or grey-brown, feathers with narrow pale edges and tips; chin and throat black, underparts off-white; iris dark brown; bill black; legs pale brown to pinkish-brown. Non-breeding male is like breeding male, but plumage pattern partially obscured by pale feather tips, bill horn-coloured. Female is sandy brown to dull cinnamon above, with very conspicuous long, bright creamy supercilium, broad pale and dark stripes on mantle, white chin and throat, yellowish bill with dark tip; similar to female of *P. domesticus*, but more brightly marked, with far more striking supercilium. Juvenile is similar to female, but duller. Race *cinnamomeus* male has strong yellow tinge on cheeks and underparts; *intensior* is like last, but deeper russet tone above, yellow on face and underparts much paler. Voice. Main call a monosyllabic "cheep" or "chilp", used by male for proclaiming nest-site ownership; several notes may be strung together to form short musical song, "cheep chirrup cheeweep"; these among the most musical calls of any of the sparrows. Threat call "chit-it-it".
Habitat. In W of range occupies light woodland, terrace cultivation around edges of villages, and more open parts of built-up areas; montane, from c. 1000 m to 4300 m, breeding mostly to 2300 m, down to edge of plains, to c. 500 m, in non-breeding season. In E occurs in open woodland, forest edges and cultivation, descending to sea-level. Often in cultivated fields in winter months.
Food and Feeding. Principally seeds, including those of cultivated cereals, also small berries. Nestlings fed almost exclusively with animal food, mainly caterpillars and grubs. Obtains insect items by searching leaves and, to lesser extent, by seizing them in flight. Collects in large flocks in winter to feed on spilt grain and weed seeds in stubbles of cultivated fields.
Breeding. Season Apr–Jul; two broods. Solitary; not particularly colonial. Nest built by both sexes, an untidy collection of grass, lined with hair and feathers, placed in hole, mainly in tree, but also in house eaves or other cavity in building, in embankment or in stone wall, or in old nest of hirundine; in E of range also builds free-standing nest in branches of shrub. Clutch 4–6 eggs; incubation of eggs and tending of young by both parents; no further information.
Movements. Those breeding at high altitudes in Himalayas descend to 500–1000 m in winter. Farther E, migratory, with a general withdrawal from higher latitudes to areas S of breeding range, including N Thailand.
Status and Conservation. Not globally threatened. Common in W of range. Possibly decreasing in E parts of range, where formerly abundant as a passage migrant in flatlands of N Honshu (Japan), but now much less numerous. Rare and declining in Taiwan.
Bibliography. Ali (1977), Ali & Ripley (1974), Brazil (1991), Chae Hee-Young (1997a, 1997b, 1998), Cheng Tsohsin (1987), Clement *et al.* (1993), Dementiev *et al.* (1954, 1970), Fu Tongsheng *et al.* (1998), Haneda & Kumagai (1975), Hartert (1904), Li Dehao *et al.* (1978), Nechaev (1973), Rasmussen & Anderton (2005b), Roberts (1992), Robson (2000), Schäfer (1938), Smythies (1986), Stepanyan (2003), Summers-Smith (1988), Tomek (2002), Vaurie (1972), Whistler & Kinnear (1949), Wu Lirong *et al.* (2004), Yamashina (1961), Zhang Qingxia *et al.* (2003).

8. Pegu Sparrow

Passer flaveolus

French: Moineau flavéole **German**: Gelbbauchsperling **Spanish**: Gorrión Liso
Other common names: Plain-backed/Olive-crowned Sparrow, Pegu House Sparrow

Taxonomy. *Passer flaveolus* Blyth, 1845, Arakan, Myanmar.
Probably evolved from an isolated population of sparrows that was trapped in an unglaciated refugium in Mekong Delta (S Vietnam) during last glaciation of Pleistocene (25,000–15,000 years ago). Monotypic.
Distribution. Myanmar (except N & SW), Thailand, Laos, Cambodia, C & S Vietnam and N Peninsular Malaysia.
Descriptive notes. c. 14 cm; 17–23 g. Male breeding has crown to upper mantle greenish-grey, forehead and side of forecrown yellowish, lores black, crescent-shaped chestnut band behind eye, around rear of yellow ear-coverts and cheek and extending down to side of neck; lower mantle and upper back, scapulars and lesser upperwing-coverts chestnut, lower back to uppertail-coverts greyish-yellow; median upperwing-coverts dull yellowish to olive, greater coverts blackish with broad



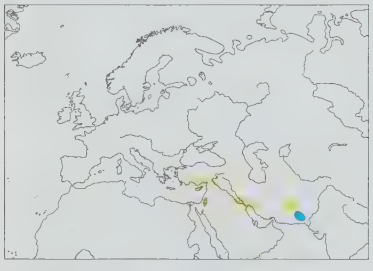
pale edges and narrow pale tips; flight-feathers black with narrow yellowish edges; tail dark grey or grey-brown, feathers narrowly edged pale; chin and centre of throat black, side of throat pale yellow; underparts pale yellow, greyer on breast and flanks; iris dark brown; bill black; legs brown to pinkish-brown. Non-breeding male is similar to breeding, but plumage pattern somewhat obscured by pale feather tips, bill horn-coloured. Female has very "clean" appearance, is plain brownish above, with prominent broad buffish supercilium, wing much as male's, chin and throat whitish-yellow to buffish-white, underparts similar to male's, bill light pinkish-horn. Juvenile resembles female. Voice. Main call a loud, clear disyllabic "chirrup", second syllable rather slurred, used by both sexes at nest and roost, similar to "chirrup" call of *P. domesticus*. Threat "chit-chit-chit" or "chi-chi-chip-chip", and alarm "chu chu" or "chu-chu-weet"; these also regularly heard from roost as birds settle for the night.
Habitat. Cultivated areas with trees, plantations and small copses, scrub, and woodland edges; also occurs at edges of areas inhabited by man, where it overlaps with *P. montanus*. Lowlands to at least 1500 m.
Food and Feeding. Predominantly vegetable matter, including seeds of grasses, cultivated cereals and small herbs. Nestlings fed with insects, mainly aphids (Aphidoidea), bugs (Hemiptera) and the caterpillars of Lepidoptera. Collects insects from small outer branches of trees by manoeuvring acrobatically, also by searching on ground. Forages in small groups; in larger flocks in non-breeding season.
Breeding. Season mainly Jan–Jul, but breeding recorded in most months of year; probably two broods. In loose colonies, usually of 5–10 pairs, but occasionally up to 30 pairs. Nest a loosely woven globular structure of grasses, small twigs and rootlets, domed, with entrance on side, lined with feathers, well hidden in branches of tree, or placed in hole in tree or building, or sometimes in cavity in other structure (e.g. lamppost). Clutch 3–4 eggs; young reared by both sexes; no information on duration of incubation and nestling periods.
Movements. Nomadic outside breeding season, wandering to gather at ripening rice paddies.
Status and Conservation. Not globally threatened. Locally common. Formerly more restricted in range; spread S along Malay Peninsula as forest clearance in middle of 20th century created open country suitable for this species.
Bibliography. Clement *et al.* (1993), Lekagul & Round (1991), McClure & Kwanyuen (1973), Medway & Wells (1976), Pantuwatana *et al.* (1969), Robson (2000), Ruelle (1992b), Smythies (1986), Summers-Smith (1981, 1988), Wells (2007), Williamson (1918).

9. Dead Sea Sparrow

Passer moabiticus

French: Moineau de la mer Morte **German**: Moabsperling **Spanish**: Gorrión del Mar Muerto
Other common names: Scrub Sparrow; Afghan Scrub Sparrow, Yates's Sparrow (*yatii*)

Taxonomy. *Passer moabiticus* Tristram, 1864, Israel and Jordan.
Probably evolved from an early sparrow population that was trapped in an ice-free area in Tigris–Euphrates Valley during last glaciation of Pleistocene (25,000–15,000 years ago). E race *yatii* sometimes considered to be a separate species, primarily on grounds of its morphology and geographical separation. Birds in S Turkey, N Syria, Iraq and SW Iran sometimes treated as additional race, *mesopotamicus* (described from SW Iran), but character details appear indistinguishable from those of nominate and published mensural data overlap with those of latter. Two subspecies currently recognized.
Subspecies and Distribution.
P. m. moabiticus Tristram, 1864 – S Turkey, Cyprus, Israel, W Jordan, N Syria and C Iraq E to SW Iran.
P. m yatii Sharpe, 1888 – Seistan region, on borders of E Iran and SW Afghanistan.



Descriptive notes. 12 cm; 14–20 g. Male nominate race breeding has head and nape mainly pale grey, long pale supercilium whitish at front and becoming broader and more buffish behind eye, black lores, white submoustachial stripe, small black bib on chin and throat, pale yellow patch at side of throat; upperparts buff, mantle and back streaked black, scapulars greyer and streaked, rump and uppertail-coverts grey; lesser upperwing-coverts black, tipped white, median and greater coverts chestnut with pale tips, flight-feathers black with broad sandy edges; tail dark brownish with paler edges; underparts greyish-white, greyer on breast, undertail-coverts white with reddish-buff tips; iris dark brown; bill black; legs pale pinkish-brown. Non-breeding male is somewhat duller, plumage pattern obscured by paler feather tips, bill horn-coloured. Female is similar to male but paler and buffish, lacking chestnut colour, with pale buff line on each side of mantle, no black bib, bill yellowish with dark tip. Juvenile resembles female but is less bright, with duller supercilium, no yellow on side of throat. Race *yatii* is paler than nominate, washed yellowish on lower parts. Voice. Noisy at nest-site, otherwise rather quiet. Male nest-ownership call "chip-chip-chip" or "chip-chip-chizz"; this becomes excited "chilling-chillung-chillung" or "tweng-tweng-tweng" (with wings raised and flicked) to attract a female. Both sexes have "chur-it-it-it chit-it-it chitup chittup" alarm associated with tail-flicking. Female uses soft "tweeng tweeng tweeng" as invitation to copulation. Also indulges in "social song" consisting of soft conversational notes when individuals collect in trees between bouts of feeding.
Habitat. Riverine or lacustrine areas with trees or scrub, and irrigated semi-desert where flush of annual grasses. Outside breeding season in cultivated land. Unusually for genus, has no association with built-up areas or habitations.
Food and Feeding. Predominatly a seed eater, specializing on smaller seeds of grasses, rushes and sedges, shrubs and trees. Nestlings fed with both invertebrates and seeds. Searches leaves of trees for insects. Forages also on ground. In loose flocks.
Breeding. Season Mar–Jul; up to three broods. Breeds in loose colonies of 10–100 pairs. Nest a large ovoid structure, mean diameter 30 cm, domed, entrance spiralling down from top, strongly

constructed from dead twigs, lined with feathers and plant down, built openly in branches of tree, frequently dead tree standing in water. Clutch 3–5 eggs; incubation by female only, eggs may be uncovered during heat of day in high-temperature regions, period c. 12 days; chicks fed mainly by female, nestling period 14–15 days.

Movements. Migratory and partially migratory. Leaves breeding areas in autumn, apparently dispersing into more open areas and some withdrawing S. In W of range, recent records suggest S movement in Israel, some reaching NE Egypt (Sinai), and others reported from Eastern Province of Saudi Arabia S to Bahrain and United Arab Emirates, but information on winter distribution in this relatively poorly studied area very scanty. E race *yatii* makes definite S migration to N Baluchistan, in W Pakistan.

Status and Conservation. Not globally threatened. Locally common in W of range; locally common in Afghanistan. Numbers in breeding colonies tend to rise and fall, particularly with changes in land use. Has extended its range since middle of 20th century. First recorded Cyprus in 1973 and bred in dead trees in saline lake near Akrotiri from 1976; became extinct in 1980s when lake dried out, although small numbers considered still to breed on the island.

Bibliography. Ali & Ripley (1974), Boros & Horváth (1954), Carruthers (1910a, 1910b, 1949), Christison (1941), Clement *et al.* (1993), Cramp & Perrins (1994), Dickinson (2003), Dijkstra (1992), Hartert (1904), Hirschfeld & Symens (1992), Kirwan (2004), Kirwan *et al.* (2008), Lulav (1967), Marchant (1963), Meinertzhagen (1954), Mendelssohn (1955), Rasmussen & Anderton (2005b), Scott *et al.* (1975), Shirihai (1996), Summers-Smith (1988), Yom-Tov (1980), Yom-Tov & Ar (1980), Yom-Tov, Ar & Mendelssohn (1978), Yom-Tov, Mendelssohn & Ar (1976).



10. Cape Verde Sparrow

Passer iagoensis

French: Moineau du Cap-Vert **German**: Kapverdensperling **Spanish**: Gorrión de Cabo Verde
Other common names: Iago/Rufous-backed Sparrow

Taxonomy. *Pyrgita Iagoensis* Gould, 1838, São Tiago, Cape Verde Islands.
Forms a superspecies with *P. cordofanicus*, *P. shelleyi*, *P. insularis*, *P. rufocinctus* and *P. motitensis*, and all sometimes considered conspecific. Treated as distinct species on grounds mainly of morphological and behavioural differences from others. Monotypic.
Distribution. Cape Verde Is, off W Africa.



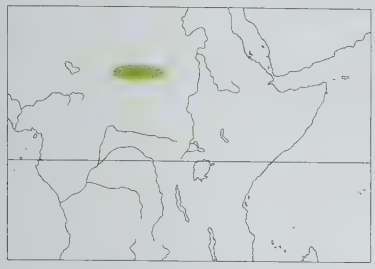
Descriptive notes. 12·5–13 cm. Small compact sparrow. Male breeding has forehead, crown and lores blackish, supraloral line whitish, narrow black line behind eye, nape to mantle grey; side of head silvery white, broad rufous-brown band from side of crown behind eye, extending behind ear-coverts and curving down to lower side of neck; scapulars and back chestnut, streaked black, lower back rich brown to chestnut, uppertail-coverts grey (sometimes tinged brown); median upperwing-coverts black with broad white tips, greaters dark brown with paler edges and pale buff-brown tips, flight-feathers blackish, secondaries and tertials edged pale buff-brown, small sandy area at base of primaries; tail dark brown with narrow pale edges; chin and central throat black (small bib); underparts silvery white, greyer on side of breast and flanks; individuals nesting in holes in lava cliffs become noticeably worn through abrasion caused by lava as they regularly enter and leave nest-site; iris dark brown; bill black; legs brown or flesh-brown. Non-breeding male is duller, bill horn-coloured. Female is mostly grey-brown with conspicuous creamy supercilium, pattern of upperparts and wing as for male but duller, lacking chestnut tones, chin and throat white. Juvenile is similar to female, with supercilium sometimes cinnamon and sometimes pale cream (presumably male and female, respectively, though this requires confirmation). Voice. Call of male a twangy "cheesp", "chew-weep" or "chew-leep", used to proclaim nest ownership; notes sometimes strung together into a song, "cheep chirri chip cheep chirri chip cheep". Churring "chur-chur-chur" alarm and a speeded-up version, "chur-it-it-it-it", used by both sexes at nest.
Habitat. Typically in dry lava plains to coastal cliffs, but extending also into cultivated land and built-up areas, where it becomes a complete town bird. Breeds together with *P. domesticus* in Mindelo, the principal town on São Vicente.
Food and Feeding. Mainly seeds of small plants, including grasses and cultivated cereals; also domestic scraps in urban areas. Nestlings fed with caterpillars of Lepidoptera and grasshoppers (Orthoptera). Gregarious; in small groups when breeding, and in larger flocks at other times.
Breeding. Season Sept–Mar, associated with rains. In loose colonies. Nest domed, with entrance at side, constructed from thin plant stems, lined with hair and feathers, mainly in hole in lava cliff, stone wall, building, street light or under boulders, sometimes a free-standing nest, 15 × 25 cm, in branches of tree. Clutch 3–5 eggs; both sexes take part in rearing of young. No information on incubation and fledging periods.
Movements. Mainly sedentary; presumably some dispersal that replenishes populations on smaller islands, which tend to die out and later become re-established.
Status and Conservation. Not globally threatened. Restricted-range species: present in Cape Verde Islands EBA. Common and widespread in its limited range. Sporadic on some of the smaller islands, e.g. Branco, Sal and Santa Luzia; strangely, is absent from Fogo.
Bibliography. Alexander (1898a, 1898b), Bannerman & Bannerman (1968), Barone Tosco (2005), Borrow & Demey (2001), Bourne (1955, 1966), Clement *et al.* (1993), Cramp & Perrins (1994), Hazevoet (1995), de Naurois (1988), Summers-Smith (1984a, 1984b, 1988), Vaurie (1958b), White (1963), White & Moreau (1958).

11. Kordofan Rufous Sparrow

Passer cordofanicus

French: Moineau du Kordofan **German**: Kordofansperling **Spanish**: Gorrión del Kordofán
Other common names: Sudan Rufous Sparrow

Taxonomy. *Passer cordofanicus* Heuglin, 1874, Melspez, Kordofan, Sudan.
Forms a superspecies with *P. iagoensis*, *P. shelleyi*, *P. insularis*, *P. rufocinctus* and *P. motitensis*, and all sometimes considered conspecific. Monotypic.
Distribution. E Chad (E from Oum-Hadjer) and W Sudan (Darfur and Kordofan).
Descriptive notes. 13–15 cm. Small sparrow with heavy, slightly arched bill. Male has blue-grey crown and nape, black lores, crescent-shaped chestnut band behind eye and down to side of neck, white cheek separated from crown by narrow black line behind eye and around ear-coverts, small



and narrow black bib; upperparts chestnut, upper back boldly streaked black; upperwing blackish to dark brown, feathers edged buffish, broad white tips on median coverts, narrow buff tips on greater coverts, small buff or sandy patch at base of primaries; tail dark brown, outer feathers edged paler; underparts pure white; iris dark brown; bill horn-coloured, becoming black in breeding season; legs brownish. Distinguished from very similar *P. motitensis* mainly by distinctly smaller size, and white (not pale grey) cheek and underparts. Female is similar to male but paler, with black areas replaced by grey, chestnut on head paler and buffier. Juvenile resembles female, but with paler and washed-out appearance. Voice. Not studied; said not to be distinguishable from that of other sparrows, e.g. *P. motitensis*.

Habitat. Arid country, usually near villages and surrounding cultivated land.

Food and Feeding. Few data. Mainly grain and seeds.

Breeding. Season Jun–Sept in Chad and Sept–Nov in Sudan. Nest an untidy spherical bundle of dry grass, domed and with long entrance tunnel, placed in thorny bush. Clutch 3–5 eggs. No other information.

Movements. No information. Presumed mainly resident.

Status and Conservation. Not globally threatened. Common to locally common within small range.

Bibliography. Cave & Macdonald (1955), Clement *et al.* (1993), Dickinson (2003), Fry & Keith (2004), Grant & Mackworth-Praed (1944a), Hall & Moreau (1970), Lynes (1924), Mackworth-Praed & Grant (1960), Nikolaus (1987), Summers-Smith (1988), White (1963), White & Moreau (1958).

12. White Nile Rufous Sparrow

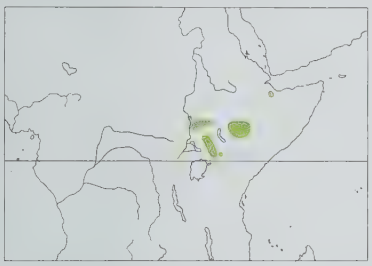
Passer shelleyi

French: Moineau de Shelley **German**: Nilsperling **Spanish**: Gorrión de Shelley

Taxonomy. *Passer shelleyi* Sharpe, 1891, Lado, southern Sudan.

Forms a superspecies with *P. iagoensis*, *P. cordofanicus*, *P. insularis*, *P. rufocinctus* and *P. motitensis*, and all sometimes considered conspecific. Monotypic.

Distribution. SE Sudan, NE Uganda, W Kenya, S & E Ethiopia and NW Somalia.



Descriptive notes. 13–15 cm. Male has pale blue-grey crown and nape to upper mantle, black lores, crescent-shaped chestnut band and thin black line from behind eye extending to side of neck, grey to dull white ear-coverts and cheek, small and narrow black bib; upperparts posterior to upper mantle pale chestnut, back boldly streaked black; upperwing dark brown to blackish, feathers edged buffish, broad white tips on median coverts, narrow buff tips on greater coverts, small pale patch at base of primaries; tail dark brown, outer feathers edged paler; underparts dusky grey, becoming lighter on belly; iris dark brown; bill horn-coloured, becoming dark slate in breeding season; legs brownish. Differs from similar *P. motitensis* mainly in smaller size and less brightly coloured plumage. Female is like male but duller, with bib dark grey (rather than black), chestnut areas more buffy. Juvenile resembles female, but with paler, washed-out appearance. Voice. Few details. Musical chirps and harsher scratchy calls reported.

Habitat. Mainly open grassy savanna with trees, at 1000–1700 m, extending into semi-desert on the one hand and into light woodland on the other; also, to limited extent, cultivated land and vicinity of habitations, but not penetrating into villages. Does not associate with humans.

Food and Feeding. Little information. Feeds mainly on the ground, presumably on seeds and insects.

Breeding. Sept–Nov and Mar–Jun. Breeds in small colonies. Nest built by both sexes, ovoid in shape, domed, with entrance on side, loosely constructed from dry grasses, lined with feathers, placed 1–2 m above ground in branches of thorny acacia (*Acacia*). Clutch 3–6 eggs, normally 4. No other information.

Movements. No information.

Status and Conservation. Not globally threatened. Moderately common in Ethiopia, fairly common in Uganda, and rare in Kenya; uncommon to rare elsewhere.

Bibliography. Archer & Godman (1961), Ash & Atkins (2009), Benson (1947), Britton (1980), Cave & Macdonald (1955), Clement *et al.* (1993), Dickinson (2003), Fry & Keith (2004), Hall & Moreau (1970), Mackworth-Praed & Grant (1960), Nikolaus (1987), Redman *et al.* (2009), Summers-Smith (1988), White (1963), White & Moreau (1958), Williams & Arlott (1980).

13. Socotra Sparrow

Passer insularis

French: Moineau de Socotra **German**: Sokotrasperling **Spanish**: Gorrión de Socotora
Other common names: Abdelkuri Sparrow (*hemileucus*)

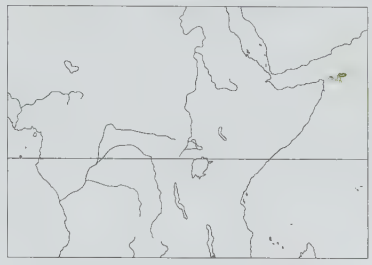
Taxonomy. *Passer insularis* P. L. Sclater and Hartlaub, 1881, Socotra Island.

Forms a superspecies with *P. iagoensis*, *P. cordofanicus*, *P. shelleyi*, *P. rufocinctus* and *P. motitensis*, and all sometimes considered conspecific. It has been suggested that pale race *hemileucus* may represent a full species, apparently genetically divergent from nominate, also that population on islet of Samha might warrant treatment as an additional, small race of present species; further study required. Two subspecies recognized.

Subspecies and Distribution.

P. i. hemileucus Ogilvie-Grant & H. O. Forbes, 1900 – 'Abd al Kuri I (between NE Somalia and Socotra).

P. i. insularis P. L. Sclater & Hartlaub, 1881 – Socotra I, including islets of Samha and Darsa.



Descriptive notes. 13–14 cm; 20–35 g. Male nominate race has forehead to hindneck and entire upperparts grey, prominent black eyestripe, broad rufous-chestnut band from above eye and in crescent around rear of ear-coverts, light greyish ear-coverts and white cheek; back streaked black, prominent chestnut on scapulars; upperwing blackish to dark brown, feathers edged buffish to warm brown, lesser coverts chestnut, broad white tips on median coverts, narrow buff tips on greater coverts, small pale patch at base of primaries; tail dark brown, outer feathers edged paler; chin and throat to upper breast black; underparts greyish; iris dark brown; bill black throughout year; legs brownish. Female is drab brown with greyer upperparts, streaked on back, warm buff supercilium curving down behind ear-coverts, blackish stripe through eye and curving around rear of ear-coverts; bare parts as for male. Juvenile resembles female. Race *hemileucus* is generally paler than nominate, and smaller than birds from Socotra but larger than those from Samha. Voice. Dry chirping calls, "cheep", "chee-cheep", "chip" and "jip"; scolding "jer-jer" and rattling "jajajajajaja" are probably alarm and threat calls.

Habitat. Semi-arid scrub and woodland, also in palm groves, around human settlements, and arid limestone areas; up to 1500 m.

Food and Feeding. Little known. Assumed to take seeds of grasses and small plants (cereals not grown on islands where it lives), but some grain seeds may be available as food for domestic animals. Most water probably obtained from plants (no surface water present on 'Abd al Kuri), but on Socotra freely comes to water put out for camels. Often in flocks of 30–50 individuals.

Breeding. Season Nov–Apr; two broods. Breeds in colonies of up to ten pairs; sometimes solitarily. Nest an untidy construction of dead grass, lined with feathers, placed in hole in cliff, house or tree, or openly in branches of thorny tree. Clutch 3 eggs. No other information.

Movements. Resident; some local wandering.

Status and Conservation. Not globally threatened. Restricted-range species: present in Socotra EBA. Abundant on Socotra, where population estimated at c. 250,000 individuals; over 5000 birds on Samha, and over 1000 each on Darsa and 'Abd al Kuri.

Bibliography. Clement *et al.* (1993), Dowsett-& Dowsett-Lemaire (1993), Dymond (1996), Forbes (1903), Fry & Keith (2004), Grant & Mackworth-Praed (1944a), Hall & Moreau (1970), Helbig *et al.* (2002), Kirwan (2008), Kirwan *et al.* (1996), Porter *et al.* (1996), Redman *et al.* (2009), Ripley & Bond (1966), Ryan *et al.* (2008, 2009), Summers-Smith (1988), White (1963), White & Moreau (1958), Wolters (1982).

14. Kenya Rufous Sparrow

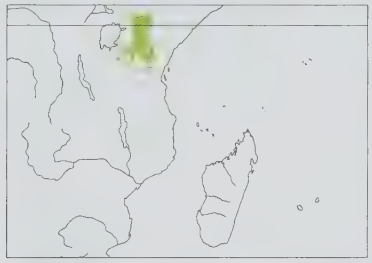
Passer rufocinctus

French: Moineau roux **German**: Keniasperling **Spanish**: Gorrión Keniata
Other common names: Rufous Sparrow

Taxonomy. *Passer rufocinctus* G. A. Fischer and Reichenow, 1884, Lake Naivasha, Kenya.

Forms a superspecies with *P. iagoensis*, *P. cordofanicus*, *P. shelleyi*, *P. insularis* and *P. motitensis*, and all sometimes considered conspecific. Monotypic.

Distribution. Rift Valley highlands from C Kenya S to N Tanzania.



Descriptive notes. 13–14 cm; 25–32 g. Male has crown to upper mantle, ear-coverts and cheek blue-grey, lores black, chin and throat black, broad chestnut crescentic band extending from above eye around rear of ear-coverts and on neck side forwards almost to black throat patch; lower mantle to uppertail-coverts rufous-chestnut, streaked black on mantle and upper back; upperwing blackish to dark brown, feathers edged buffish, broad white tips on median coverts, small pale patch at base of primaries; tail dark brown, outer feathers edged paler; underparts greyish; iris pale; bill horn-coloured, becoming dark slate in breeding season; legs brownish. Differs from very similar *P. motitensis* mainly in smaller size, pale eye, greyer face, and more grey on neck and mantle. Female is similar to male but duller, with bib dark grey (rather than black) and chestnut replaced by buff. Juvenile is similar to female, but with paler, washed-out appearance. Voice. Call a loud "chreep", "chuweep" or upward-inflected "cher-weep", deeper than that of *P. domesticus*; used for proclaiming nest-site ownership. Song described as thin, sharp metallic notes often alternating with few lower chirps. Nasal "jewy" or "jerwey" and sharp "tsui" or "tseu-pee" presumably threat and alarm calls, respectively.

Habitat. Dry acacia (*Acacia*) savanna, open wooded country, cultivated land, villages and towns; at 1000–3000 m.

Food and Feeding. Grain, small seeds, domestic scraps; insects fed to unfledged young. Feeds more on ground than does *P. motitensis*. Forages in pairs; sometimes in small groups of up to about ten individuals outside breeding season.

Breeding. Breeds in all months, mainly Apr–Jun and Nov–Dec (coinciding with, respectively, long rains and short rains); possibly two broods. Solitary. Nest built by both sexes, a large, loosely constructed ovoid structure, domed, with entrance on side or near top, mostly of grasses, lined with feathers and animal hair, placed usually in branches of tree, sometimes in more covered site such as creepers on electricity pylon, deserted nest of weaver (Ploceidae) or in thatch of house roof. Clutch 3–5 eggs, occasionally 6. No other information available.

Movements. Resident; some dispersal to lower elevations in non-breeding season.

Status and Conservation. Not globally threatened. Generally common throughout much of its range.

Bibliography. Archer & Godman (1961), Britton (1980), Brown & Britton (1980), Clement *et al.* (1993), Collias & Collias (1964), Dickinson (2003), Friedmann (1937), Fry & Keith (2004), Grant & Mackworth-Praed (1944a), Mackworth-Praed & Grant (1960), Summers-Smith (1988), White (1963), White & Moreau (1958), Williams & Arlott (1980), Zimmerman *et al.* (1996).

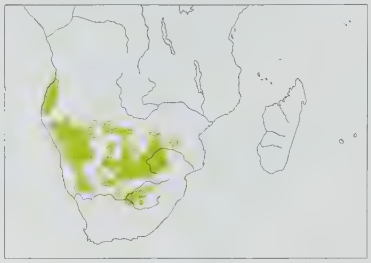
On following page: 15. Southern Rufous Sparrow (*Passer motitensis*); 16. Cape Sparrow (*Passer melanurus*).

15. Southern Rufous Sparrow

Passer motitensis

French: Grand Moineau **German**: Rostsperling **Spanish**: Gorrión Grande
Other common names: Great/Rufous Sparrow; Namibia (Rufous) Sparrow (*benguellensis*)

Taxonomy. *Pyrgita Motitensis* A. Smith, 1836, Hopetown, northern Cape Province; error = Motita, near Old Lakatoo, 135 miles [c. 215 km] north of Orange River, South Africa.
Forms a superspecies with *P. iagoensis*, *P. cordofanicus*, *P. shelleyi*, *P. insularis* and *P. rufocinctus*, and all sometimes considered conspecific. Three subspecies recognized.
Subspecies and Distribution.
P. m. benguellensis Lynes, 1926 – coastal SW Angola and Namibia.
P. m. motitensis (A. Smith, 1836) – Botswana and N South Africa (N Northern Cape and North West Province).
P. m. subsolanus Clancey, 1964 – SW Zimbabwe and N & C South Africa (Limpopo Province S to N & W Free State).



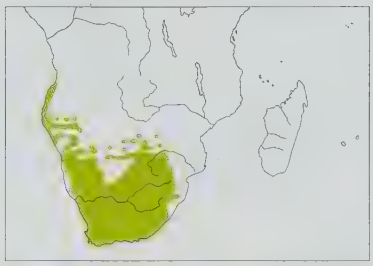
Descriptive notes. 15–16 cm; 26–36 g. One of the largest sparrows, with bill slightly arched. Male nominate race has blue-grey crown and nape, black lores, a crescent-shaped chestnut band (bordered below with trace of black) from eye to side of neck and encircling paler grey ear-coverts, small black bib on chin and central throat; upperparts chestnut, mantle and inner scapulars boldly streaked black; upperwing blackish to dark brown, feathers edged buffish, broad white tips on median coverts, narrower rufous-buff tips on greater coverts, small pale or sandy patch at base of primaries; tail dark brown, outer feathers edged paler; underparts pale grey; iris dark brown; bill horn-coloured, becoming black in breeding season; legs brown or reddish-brown. Female has much the same plumage pattern as male, including small grey bib, but chestnut areas duller, and on head replaced by creamy buff; bill darker than that of other female sparrows. Juvenile resembles female, but has paler, washed-out appearance. Race *benguellensis* is less rufous above and generally paler than nominate; *subsolanus* is more rufous and with heavier streaking above, pale grey below. Voice. Main call a twangy "cheeurr" or "wer-cheerr", fuller and rather deeper in tone than the "chirrup" of *P. domesticus*, given by male to proclaim nest ownership; "cheeurr" and other, similar call notes can be strung together into a song. Partners at nest greet each other with variety of soft conversational notes, "chee-ti-cheet", "ti-cheet-it" or "chee-wee". Fast "churr" in threat; nasal "jwer" to signify alarm.
Habitat. Dry acacia (*Acacia*) savanna, frequenting trees; not associated with man.
Food and Feeding. Seeds of grass and cultivated cereals. Nestling diet is animal food, with caterpillars (Lepidoptera) recorded. Less gregarious than most sparrows; usually in pairs, occasionally in small flocks (e.g. at water-drinking sites).
Breeding. Season Sept–Feb; two broods. Solitary. Nest built by both sexes, free-standing ovoid about the size of a rugby football, domed, with entrance near top at end, constructed mainly from grass, lined with feathers and plant down, placed in branches of thorny tree, occasionally in crevice in rocks. Clutch 3–6 eggs; incubation period 12–14 days; chicks fed by both parents, nestling period 15–18 days.
Movements. Nomadic, with post-breeding dispersal.
Status and Conservation. Not globally threatened. Locally common to uncommon in South Africa; somewhat uncommon elsewhere and generally local. Density in Botswana and N South Africa (N Limpopo Province) 1 pair/100–500 ha (equivalent to 0·2–1 pair/km²).
Bibliography. Clancey (1964b, 1965), Clement *et al.* (1993), Dowsett (2009), Fry & Keith (2004), Grubbe (1990), Hall & Moreau (1970), Harrison *et al.* (1997), Hockey *et al.* (2005), Macdonald (1957), Maclean (1985), Milewski (1975), Milstein (1975), Summers-Smith (1983, 1988), Traylor (1965), White (1963), White & Moreau (1958), Winterbottom (1966).

16. Cape Sparrow

Passer melanurus

French: Moineau mélanure **German**: Kapsperling **Spanish**: Gorrión de El Cabo

Taxonomy. *Loxia melanura* Statius Müller, 1776, Cape Town, South Africa.
Hybridization with *P. domesticus* recorded. Race *vicinus* sometimes subsumed into nominate. Three subspecies currently recognized.
Subspecies and Distribution.
P. m. damarensis Reichenow, 1902 – extreme SW Angola, Namibia, W and E Botswana and extreme W Zimbabwe S to N South Africa (S to Northern Cape, North West Province and N Limpopo Province).
P. m. melanurus (Statius Müller, 1776) – SW South Africa (S Northern Cape and Western Cape E to SW Free State).
P. m. vicinus Clancey, 1958 – E South Africa (S Limpopo Province S to E Free State, W KwaZulu-Natal and Eastern Cape) and Lesotho.



Descriptive notes. 14–16 cm; 17–38 g. Male nominate race has entire head down to upper breast black apart from white crescent-shaped band from eye back to nape and then forward to side of lower throat; upperparts, including scapulars and lesser upperwing-coverts, chestnut, uppertail-coverts grey; upperwing dark brown with warm buffish edges, median coverts tipped white, greater coverts narrowly tipped buffish to off-white, small pale patch at base of primaries; tail dark brown with narrow pale edges; underparts below upper breast greyish on sides, whiter on central abdomen and undertail-coverts; iris dark brown; bill horn-coloured, becoming black in breeding season; legs dark brown to blackish-brown. Female has plumage pattern similar to that of male, but with black replaced by grey and the chestnut areas duller. Juvenile is like female. Race *damarensis* is slightly smaller than nominate, male with black of head tinged brown, female paler; *vicinus* is larger than nominate, male with black more glossy and underparts pure white, female darker. Voice. Call of male at nest a distinctive, loud and far-carrying "tweeng" or "twilleeng", which can change into a jerky, repetitive song with variants of call notes, e.g. "chu chup chiju chip choop chollop chlip chop chrreep", given at rate of two calls per second; much more melodious than familiar "chirrup" call of *P. domesticus*. Has typical sparrow "churr", used in threat; flight call "chui".
Habitat. Semi-arid regions with annual rainfall less than 750 mm, from open savanna with trees to light woodland; also in cultivated land and built-up areas, where it tends to be commoner than in presumed original habitat of grassland savanna. Normally not far from water source.
Food and Feeding. Primarily seeds, specializing on larger seeds of grasses and cultivated cereals; to lesser extent soft shoots and buds of plants, nectar and, in recent years, grapes and other cultivated fruits. Some animal food taken during breeding season, and nestlings fed mainly with caterpillars of Lepidoptera. Takes some insects in flight. Drinks regularly. In small groups and flocks; flocks of up to c. 200 individuals in non-breeding season.
Breeding. In arid regions an opportunist breeder, depending on rains and associated flush of insects; in cultivated regions more regular pattern, breeding mainly Oct–Feb; one or two broods, but up to five in more favoured areas. Mainly social breeder, in loose colonies of 50–100 pairs, a small proportion solitary; extremely territorial. In unusual group display, 20–50 individuals, of both sexes, gather close together on ground, with head held up and tail touching ground, group then moves slowly along, birds hopping at irregular intervals, and one or more fly up and hover over rest of group at height of 30–60 cm; this lasts for 1–4 minutes before individuals gradually disperse; significance of behaviour, whether associated with breeding or merely with social bonding, not known. Nest built by both sexes, a loose, untidy domed structure constructed with coarse dry grass stems and small twigs, lined with feathers and soft plant material, mainly in thorn tree, sometimes on telegraph pole or pylon; nests also in covered site in creepers on wall, or hole in earth bank, haystack or building. Clutch 2–5 eggs; incubation period 12–14 days; chicks fed by both parents, nestling period 16–17 days, but can be as much as 25 days when food availability poor. Breeding success 50–69% in built-up areas, only 25% in agricultural areas; annual productivity estimated at 3·5 young per pair.
Movements. Sedentary cultivated and urban areas; nomadic in more arid areas, settling to breed when conditions favourable.
Status and Conservation. Not globally threatened. Common to locally abundant. Density near Bloemfontein (C South Africa) 152 pairs/100 ha. Has increased in cultivated districts, becoming a pest in wine-growing regions.
Bibliography. Clancey (1958), Clement *et al.* (1993), Dean (1977, 1978a), Earlé (1986, 1988), Fraser *et al.* (1992), Fry & Keith (2004), Harrison *et al.* (1997), Hockey *et al.* (2005), Immelmann (1970), Kopij (1999b), Maclean (1985), Markus (1964, 1965), McFarlane (1997), Meier (1997), Milton & Dean (1999), Rowan (1966), Saayman (1963), Seybold (1982), Siegfried (1973), Slotow & Goodfriend (1996), Slotow *et al.* (1993), Summers-Smith (1988), du Toit (1969), Tree (1966).

PLATE 50 ➤

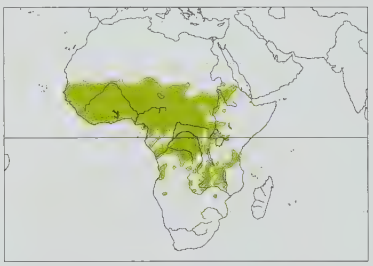


17. Common Grey-headed Sparrow

Passer griseus

French: Moineau gris **German**: Graukopfsperling **Spanish**: Gorrión Gris
Other common names: Northern Grey-headed Sparrow

Taxonomy. *Fringilla grisea* Vieillot, 1817, United States; error = Senegal.
Forms a superspecies with *P. swainsonii*, *P. gongonensis*, *P. suahelicus* and *P. diffusus*; all are often treated as conspecific, but they appear not to interbreed in at least parts of their ranges where geographical overlap occurs. It is suggested that an earlier population of grey-headed sparrows was split into five groups by a pluvial period in Pleistocene; as climate became drier, these five then spread and again came into contact with one another, but by then had become sufficiently distinct to remain separate, partly through minor habitat preferences and morphological differences. Race *mosambicus* of *P. diffusus* considered by some to belong with present species. Three subspecies currently recognized.
Subspecies and Distribution.
P. g. laeneni Niethammer, 1955 – Mali and Burkina Faso E to W Sudan, S to N Cameroon.
P. g. griseus (Vieillot, 1817) – Senegal and S Mauritania E to Ivory Coast and to S Sudan, S to N Gabon and extreme N Central African Republic; also Bioko I (Fernandóo Po).
P. g. ugandae Reichenow, 1904 – N Ethiopia, N Eritrea and SE Sudan S to Angola, extreme N Namibia, Zambia, Malawi, C & NE Tanzania and N & NE Zimbabwe.



Descriptive notes. 14–15 cm; 18–43 g. Nominate race has head and neck ash-grey, mantle and upper back grey-brown, lower back and rump dull chestnut, shoulder cinnamon-red; upperwing-coverts rusty, inner median coverts variably white, flight-feathers black with rusty edgings; tail brown with paler edges; chin and throat white, sharply demarcated from grey underparts, belly to undertail-coverts slightly paler grey; iris brown; bill black to brownish-horn; legs grey-brown or tinged slightly pinkish. Distinguished from most other members of superspecies mainly by sharply defined white throat patch. Sexes alike. Juvenile is like adult, but duller and browner, mantle slightly streaked, no white in wing-coverts, bill horn-coloured. Race *ugandae* is darker than nominate, with head grey-brown, white bib well defined, belly whiter; *laeneni* is much paler, underparts white, bib poorly differentiated. Voice. Call of male at nest a variety of harsh chirps, transcribed variously as "chip", "chirp", "cheerp" or "tyep"; notes can be

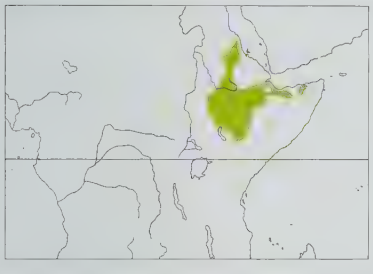
strung together with more liquid ones, such as "twee", to form rather scratchy song. Alarm a dry churring "cher-it-it-it".
Habitat. Commonly associated with cultivation and human habitations, also in grassland savanna and light woodland. Inhabits less arid country than that preferred by others of the superspecies; in areas of overlap with them, is associated more with habitations. Lowlands to 2500 m.
Food and Feeding. Largely granivorous, taking seeds of grasses and cultivated cereals; also small fruits; in urban habitats takes household scraps. Nestlings fed with variety of insects, including weevils (Curculionidae), grasshoppers (Orthoptera), ants (Formicidae) and flying termites (Isoptera). In urban areas, collects insects that have been attracted to lights at night and later lie dead on ground below. In pairs, small groups and flocks; larger gatherings outside breeding season.
Breeding. Breeds in all months of year, coinciding with local rains, but prolonged in areas with irrigated cultivation; normally three broods. Generally in loose colonies; occasionally solitary. Nest built by both sexes, domed, with entrance on side, an untidy accumulation of dead grasses, lined with feathers, placed in tree; nests also in variety of more concealed sites, such as hole in tree or building, hollow steel girder or pipe. Clutch 3–4 eggs, occasionally 2; incubation by female, period c. 16 days; chicks fed by both parents, nestling period c. 19 days.
Movements. Nomadic outside breeding season.
Status and Conservation. Not globally threatened. Common throughout range. Density in Nigeria (S Aïr) reported as 5 birds/ha. Species is currently spreading to E & SE.
Bibliography. Ash & Atkins (2009), Benson (1956), Borrow & Demey (2001), Britton (1980), Chapin (1954), Clancey (1959c), Clement *et al.* (1993), Dickinson (2003), Dowsett *et al.* (2008), Fry & Keith (2004), Gyldenstolpe (1922), Hall & Moreau (1970), Irwin (2002, 2004), Lamm (1959), Mackworth-Praed & Grant (1960, 1973), McCarthy (2006), Nhlane (1993), Nikolaus (1987), Pollard (2002), Redman *et al.* (2009), Ruelle (1992b), Serle & Morel (1977), Summers-Smith (1988), Williams & Arlott (1980).

18. Swainson's Sparrow

Passer swainsonii

French: Moineau de Swainson **German**: Swainsonsperling **Spanish**: Gorrión de Swainson

Taxonomy. *Pyrgita swainsonii* Rüppell, 1840, northern Ethiopia.
Forms a superspecies with *P. griseus*, *P. gongonensis*, *P. suahelicus* and *P. diffusus*; all are often treated as conspecific, but they appear not to interbreed in at least parts of their ranges where geographical overlap occurs. It is suggested that an earlier population of grey-headed sparrows was split into five groups by a pluvial period in Pleistocene; as climate became drier, these five then spread and again came into contact with one another, but by then had become sufficiently distinct to remain separate, partly through minor habitat preferences and morphological differences. Monotypic.
Distribution. Coastal & SE Sudan (S from Port Sudan), Eritrea, Ethiopia, N Somalia and N Kenya.



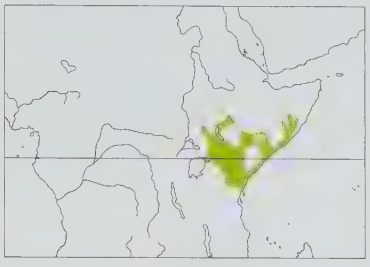
Descriptive notes. 16 cm; 27–35 g. Head, neck and underparts are darkish grey, except for small white patch on belly; indistinct paler patch on throat; mantle and back dull brown, rump chestnut; upperwing brown, except for cinnamon-red on shoulder and narrow white wingbar (tips of median coverts); tail brown; iris brown; bill black; legs grey-brown or tinged slightly pinkish. Differs from very similar *P. griseus* in being larger and darker, lacking clear white throat patch, and white wingbar tends to be more prominent; from *P. gongonensis* in being smaller and less dark, with much smaller white wingbar, smaller bill. Sexes alike. Juvenile is like adult, but lacks white on median coverts, bill paler. Voice. Call of male at nest "chirrip" or "chiri-up", similar to that of *P. griseus* but slightly more musical.
Habitat. Found in all habitats other than dense forest, from open country with bush and scrub to cultivated land, particularly in towns and villages; 1400–4500 m in Ethiopian Highlands, but also at sea-level in N of range, where confined to villages and towns.
Food and Feeding. Mainly seeds of grasses and cultivated cereals, but no detailed study available. Young fed mainly with insects. Forages in pairs and small groups; outside breeding season forms larger loose flocks, at times containing hundreds of individuals.
Breeding. Breeds at all times of year, coinciding with rains in different parts of range. Nest domed, with entrance at side, an untidy bundle of grass, lined with feathers, placed in tree; nests also in variety of enclosed sites, including hole in tree or building, crown of palm, or abandoned nest of other bird, e.g. nests of swallows (Hirundinidae) under house eaves. Clutch 3–6 eggs. No other information.
Movements. Nomadic outside breeding season, flocks roaming in search of food, but no regular pattern of migration.
Status and Conservation. Not globally threatened. Common or fairly common in almost whole of range; uncommon in Sudan. Apparently little current change in numbers.
Bibliography. Archer & Godman (1961), Ash & Atkins (2009), Benson (1947), de Bont (2009), Britton (1980), Cheesman & Sclater (1936), Clement *et al.* (1993), Dickinson (2003), Erlanger (1907), Friedmann (1937), Fry & Keith (2004), Mackworth-Praed & Grant (1960), Redman *et al.* (2009), Smith (1957), Stevenson & Fanshawe (2002), Summers-Smith (1988), Urban & Boswall (1969).

19. Parrot-billed Sparrow

Passer gongonensis

French: Moineau perroquet **German**: Papageischnabelsperling **Spanish**: Gorrión Picogordo

Taxonomy. *Pseudostruthus gongonensis* Oustalet, 1890, Gongoni, near Mombasa, Kenya.
Forms a superspecies with *P. griseus*, *P. swainsonii*, *P. suahelicus* and *P. diffusus*; all are often treated as conspecific, but they appear not to interbreed in at least parts of their ranges where geographical overlap occurs. It is suggested that an earlier population of grey-headed sparrows was split into five groups by a pluvial period in Pleistocene; as climate became drier, these five then spread and again came into contact with one another, but by then had become sufficiently distinct to remain separate, partly through minor habitat preferences and morphological differences. Monotypic.
Distribution. Extreme SE Sudan, S Ethiopia, S Somalia, extreme E Uganda, most of Kenya, and extreme NE Tanzania.



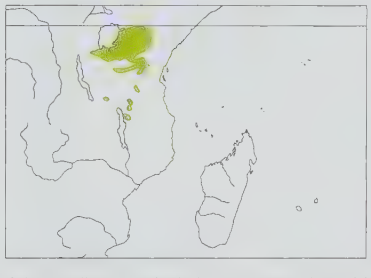
Descriptive notes. 18 cm; 33·5–48 g. The largest of the African grey-headed sparrows; distinctive heavy arched bill gives "Roman-nosed" appearance. Head, neck and underparts are mid-grey; upperparts, including tail and upperwing, brown, rump bright chestnut; upperwing-coverts bright chestnut, conspicuous white patch formed by white tips of median coverts, flight-feathers edged chestnut; iris brown; bill black; legs pale brown or pale flesh-brown. Differs from other members of superspecies in larger size, generally darker appearance, on normally more extensive wingbar. Sexes alike. Juvenile is browner than adult, lacks white wingbar, bill horn-coloured. Voice. Call "choop", can be combined in a series of similar notes to produce a song, "choop chyop choop chup chop choop", deeper in tone than those of other African grey-headed sparrows. Churring "chrrrrrrryek" presumed to be an alarm call.
Habitat. Open country and bush, extending into light woodland; in more arid country than that in which other members of the superspecies found. Infrequently seen around villages and built-up areas, although comes to regular picnic sites in game parks.
Food and Feeding. Mainly a seed-eater; recently recorded as taking bread and other scraps from the ground at lodges and picnic sites. Nestling diet not recorded, presumed to be mainly insects. Forages in pairs and small groups, rarely in larger flocks.
Breeding. Throughout year in different parts of range, breeding coinciding with rains, but also in dry season where irrigated cultivation. Nest an untidy mass of dry grass, domed, with entrance at side, lined with feathers, built in branches of tree, occasionally in hole in baobab (*Adansonia*); old nest of other species sometimes used. Clutch 2 eggs in Kenya, 4–5 in Somalia. No other information.
Movements. No information.
Status and Conservation. Not globally threatened. Common in most of range; uncommon in Sudan. Numbers apparently stable.
Bibliography. Ash & Atkins (2009), Benson (1947), Britton (1980), Clement *et al.* (1993), Dickinson (2003), Friedmann (1937), Fry & Keith (2004), Mackworth-Praed & Grant (1960), McCarthy (2006), Ruelle (1992b), Summers-Smith (1988), Williams & Arlott (1980), Zimmerman *et al.* (1996).

20. Swahili Sparrow

Passer suahelicus

French: Moineau swahili **German**: Suahelisperling **Spanish**: Gorrión Swahili

Taxonomy. *Passer griseus suahelicus* Reichenow, 1904, Bussissi, Mwanza district, northern Tanzania.
Forms a superspecies with *P. griseus*, *P. swainsonii*, *P. gongonensis* and *P. diffusus*; all are often treated as conspecific, but they appear not to interbreed in at least parts of their ranges where geographical overlap occurs. It is suggested that an earlier population of grey-headed sparrows was split into five groups by a pluvial period in Pleistocene; as climate became drier, these five then spread and again came into contact with one another, but by then had become sufficiently distinct to remain separate, partly through minor habitat preferences and morphological differences. Monotypic.
Distribution. S Kenya and N Tanzania S, patchily, to SW Tanzania.



Descriptive notes. 15–16 cm; 20–30 g. Head and neck to back and underparts are greyish-brown, rump chestnut-red; upperwing and tail brown, chestnut-red shoulder, white tips of median upperwing-coverts (rather small wingbar); sometimes paler greyish area on throat; iris brown; bill blackish-horn; legs pale brown or pale flesh-brown. Sexes alike. Juvenile is very similar to adult, but lacks white on median coverts. Voice. Song described as a varied medley of soft calls, e.g. "chup chu-weew chop wor chu-weet chip choy chaw-chip chaw wor-chip chwoop".
Habitat. Grassland with scattered trees and light woodland, particularly near water, also cultivated land and habitations. To 2000 m.
Food and Feeding. Few data. Mainly seeds; also takes scraps near villages, and around lodges of game parks.
Breeding. Jan–May, apparently coinciding with rains. Nest an untidy domed structure, tunnel entrance at side, placed in hole in tree or house, sometimes in tree; old nest of swallow (Hirundinidae) also used. No other information.
Movements. Resident; local movements during rains.
Status and Conservation. Not globally threatened. Generally common. Poorly known species; requires study.
Bibliography. Britton (1980), Clement *et al.* (1993), Fry & Keith (2004), Grant & Mackworth-Praed (1944a), Mackworth-Praed & Grant (1960), McCarthy (2006), Ruelle (1993), Schmidl (1982), Summers-Smith (1988), Zimmerman *et al.* (1996).

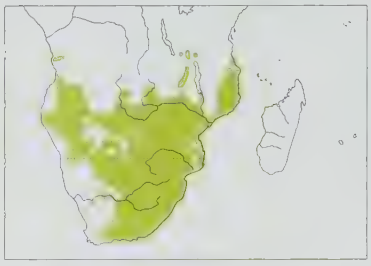
21. Southern Grey-headed Sparrow

Passer diffusus

French: Moineau sud-africain **German**: Damarasperling **Spanish**: Gorrión Sudafricano
Other common names: Cape Sparrow(!)

On following pages: 22. Desert Sparrow (*Passer simplex*); 23. Eurasian Tree Sparrow (*Passer montanus*); 24. Sudan Golden Sparrow (*Passer luteus*); 25. Arabian Golden Sparrow (*Passer euchlorus*); 26. Chestnut Sparrow (*Passer eminibey*).

Taxonomy. *Pyrgita diffusa* A. Smith, 1836, "North of the Orange river" = near Kuruman, Cape Province, South Africa.
Forms a superspecies with *P. griseus*, *P. swainsonii*, *P. gongonensis* and *P. suahelicus*; all are often treated as conspecific, but they appear not to interbreed in at least parts of their ranges where geographical overlap occurs. It is suggested that an earlier population of grey-headed sparrows was split into five groups by a pluvial period in Pleistocene; as climate became drier, these five then spread and again came into contact with one another, but by then had become sufficiently distinct to remain separate, partly through minor habitat preferences and morphological differences. Race *mosambicus* sometimes considered to belong with *P. griseus*, and *stygiceps* sometimes believed to represent darker end of cline in plumage coloration of nominate or possibly a hybrid between nominate race of present species and race *ugandae* of *P. griseus*; further study in area of overlap between the two species required in order to resolve extent to which these taxa are isolated and extent to which they intergrade. Four subspecies currently recognized.
Subspecies and Distribution.
P. d. diffusus (A. Smith, 1836) – W & S Angola E to SW & S Zambia, S to Namibia (except SW), Botswana, W Zimbabwe and W South Africa (except much of SW).
P. d. luangwae Benson, 1956 – upper Luangwa Valley, in E Zambia.
P. d. mosambicus van Someren, 1921 – SE Tanzania and N Mozambique.
P. d. stygiceps Clancey, 1954 – SE Zambia, S Malawi, N & E Zimbabwe, C & S Mozambique, NE & E South Africa, Swaziland and Lesotho.



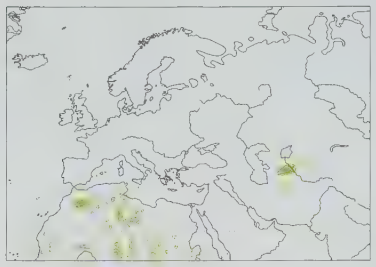
Descriptive notes. 15–16 cm; 20–29·6 g. Nominate race has head and nape pale ash-grey, often with brownish tinge, underparts pale grey, becoming whitish on belly and vent; throat sometimes paler grey than breast (but rarely distinct patch); upperparts, including upperwing, brown, lower back and rump brighter, more chestnut, shoulder and wing-coverts tinged rufous, conspicuous white wingbar formed by white tips of median coverts; tail dark brown; iris dark brown; bill dark brownish-horn, becoming black in breeding season; legs pale pinkish-brown. Sexes alike. Juvenile is similar to adult, but browner, faintly streaked above, and wingbar reduced or absent. Race *luangwae* is smaller than nominate, with finer bill, and warmer chestnut above; *mosambicus* has greyer crown and slightly warmer back; *stygiceps* is browner on upperparts and darker below. Voice. Call a repeated "chirp" or "chirrup", rather softer and more melodious than that of *P. domesticus*. Song a series of rather similar chirping notes strung together, e.g. "chyup chet chyew chyurp chip chyit chooy". Threat a churring "churrrrrdididit" (uttered with wings held out, tail fanned and slightly raised, rump feathers fluffed).
Habitat. Open acacia (*Acacia*) woodland, frequently near settlements, and penetrates into built-up areas; in N part of range occupies drier habitat, and is almost completely associated with mopane (*Colophospermum mopane*) woodland and less with cultivation and settlements.
Food and Feeding. Weed seeds and insects, also buds, berries and nectar; also scraps discarded by humans. Young fed mainly with insects, such as termites (Isoptera). Collects most food from the ground, but otherwise spends much of its time in trees. Forages in pairs and in small flocks. Unusual among *Passer* in that it walks as well as hops.
Breeding. Breeds in all months of year, coinciding with local rains; two broods. Mainly solitary, occasionally in loose colonies. Nest built by both sexes, made from dry grass, lined with feathers, placed mainly in hole in tree or building, often quite small cavity (material completely fills cavity); old nests of other species frequently used; competes for nest-sites with *P. domesticus*. Clutch 2–5 eggs, mostly 3–4; incubation by both sexes, no information on duration of period; chicks fed by both parents, nestling period 16–25 days; fledglings fed by both parents.
Movements. Mainly sedentary; reports of large concentrations suggest local movement. Recent expansion of range indicates some dispersal, presumably by young.
Status and Conservation. Not globally threatened. Common and widespread over most of relatively large range. Density in Swaziland 51 birds/100 ha. Has expanded its range since 1950s; in South Africa, significant extension W into Western Cape, but still absent from more arid Karoo.
Bibliography. Barry (2001), Benson (1956), Bridgeford (2003), Clancey (1959d), Clement *et al.* (1993), Craig *et al.* (1987), Dickinson (2003), Dowsett & Dowsett-Lemaire (1980, 1993), Dowsett *et al.* (2008), Fry & Keith (2004), Goodfellow (1966), Hines (1997), Irwin (2001, 2002), Jones, J.M.B. (2002), Maclean (1985), Markus (1967), Martin *et al.* (1987), McCarthy (2006), Oatley & Skead (1972), Pollard (2002), Summers-Smith (1988), Steyn (2000), Teschemaker (1910), Tree (1972), Ward *et al.* (2004).

22. Desert Sparrow

Passer simplex

French: Moineau blanc **German**: Wüstensperling **Spanish**: Gorrión Sahariano
Other common names: African Desert/White Sparrow

Taxonomy. *Fringilla simplex* M. H. C. Lichtenstein, 1823, Ambukol, Dongola, Sudan.
Sometimes thought, with little justification, to be part of superspecies formed by *P. domesticus*, *P. italiae* and *P. hispaniolensis*. Has been suggested that Asian and African populations might have evolved separately from *P. domesticus*, but it seems more likely that present species once had more continuous distribution (from N Africa E to W Turkestan) until probably up to 50,000 years ago, at least, but has become extinct in C regions with increased aridification. Race *zarudnyi* distinctive, and may represent a separate species. Birds in Mauritania, currently included within nominate, possibly belong to race *saharae*. Three subspecies recognized.
Subspecies and Distribution.
P. s. saharae Erlanger, 1899 – NW Sahara Desert E to W Libya, S at least to S Algeria (Ahaggar) and Chad.
P. s. simplex (M. H. C. Lichtenstein, 1823) – S Sahara from Mauritania and Mali E to S Egypt and Sudan.
P. s. zarudnyi Pleske, 1896 – Turkmenistan and W Uzbekistan.
Descriptive notes. 14–15 cm; 18–21 g. Pale, long-legged sparrow with characteristic upright posture. Male nominate race is pale grey above, sometimes with faint sandy tinge, ear-coverts and cheek white, lores black, extensive black bib from chin to upper breast; lesser upperwing-coverts same as back, median coverts white, greater coverts black with broad white tips, alula and primary coverts mostly black, flight-feathers blackish with pale grey to whitish edges, small white patch at base of primaries (often concealed); tail blackish, feathers edged white, central rectrices tipped white; underparts whitish-buff; iris brown; bill horn-coloured, becoming black in breeding season; legs pale pinkish or pinkish-brown. Female is a nondescript pale sandy or sandy-buff colour, paler below, and lacking any distinct features; wing much as male's, but dark areas paler and more sandy brown. Juvenile resembles female. Race *saharae* is larger and paler than nominate; *zarudnyi* has shorter wing and bill and longer tail, generally plainer and greyer, whiter below without marked buffish tinge, female similar to male in plumage but with grey often slightly tinged buff, and black on head and bib reduced and browner. Voice. Call harsh "tchip" or slightly rolled "chrip" or "drip". Song a high-pitched, shrill "tyi" or "tyi-tyit", alternating with downslurred "tyaa" or "tween", sometimes in 5-note phrase, e.g. "tyi tyi tyi tyi tweeuw", has been described as similar to that of White Wagtail (*Motacilla alba*). In flight a quiet twitter, similar to that of European Greenfinch (*Carduelis chloris*). Threat call a guttural chattering "chit-it-it".



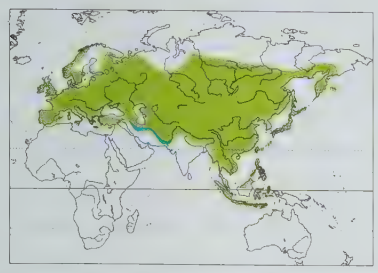
Habitat. Arid sandy areas with scattered trees and bushes. In Africa frequents oases and shrubby growth in wadis and inhabited areas; in Asia confined to bare, rocky areas with sparse trees and bushes.
Food and Feeding. Mainly seeds of desert bushes and ground vegetation, grass seeds, including those of cultivated cereals. Nestlings fed with beetles (Coleoptera), grasshoppers (Orthoptera), Lepidoptera larvae and spiders (Araneae). Takes a higher proportion of animal matter than do other sparrows (shorter alimentary tract compared with that of congeners). Probably obtains all of its water from food. Collects most of food on ground, but spends most of its time in trees. Forages in pairs and small groups; also in small flocks outside breeding season.
Breeding. Season Mar–Aug; two broods. Breeds solitarily or in small colonies, four or five nests in one tree. Nest built by both sexes, domed, with entrance sloping up to nest cup, an irregular mass of dry grass and small twigs, lined with soft plant material and feathers, placed in branches of tree, e.g. acacia (*Acacia*), or in base of large nest of crow (Corvidae) or bird of prey, in Africa more often in hole in tree, wall or deserted building. Clutch 2–6 eggs; incubation by both sexes, period 12–13 days; chicks fed by both parents, nestling period 12–14 days.
Movements. Erratic, at times common in some areas and rare or absent in others; in Asia (race *zarudnyi*), possibly some tendency for withdrawal to S in winter months.
Status and Conservation. Not globally threatened. Locally common; rare in E of range. Erratic use of different nesting areas makes it difficult to know if populations stable or decreasing; this emphasized by recent rediscovery of species in region of type locality, in N Sudan, where it was thought to have become extinct. In Sahara, tends to abandon a locality after having bred there for some years, and to appear in entirely new one. Race *zarudnyi* of C Asia similarly unpredictable, but seems much less secure, with anecdotal information suggesting possible decline and range-contraction; red-listed in Turkmenistan; formerly occurred in the Dasht-e-Lut (Great Salt Desert), in E Iran, but now extinct there. Can cause damage to cereal crops.
Bibliography. Ash & Nikolaus (1991), Borrow & Demey (2001), Clement *et al.* (1993), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Densley (1990a), Dickinson (2003), Fry & Keith (2004), Hartert (1904), Heim de Balsac (1929), Hüe & Etchécopar (1970), Ivanitskii (1997), Kirwan *et al.* (2009), Knystautas (1993), Nikolaus (1987), Ponomareva (1983), Redman (1993), Rustamov & Sopyev (1990), Scott *et al.* (1975), Sopyev (1965), Stepanyan (2003), Summers-Smith (1988), Thévenot *et al.* (2003).

23. Eurasian Tree Sparrow

Passer montanus

French: Moineau friquet **German**: Feldsperling **Spanish**: Gorrión Molinero
Other common names: (European) Tree Sparrow

Taxonomy. *Fringilla montana* Linnaeus, 1758, "in Europa" = northern Italy.
Probably evolved from a sparrow population that was isolated in Yellow R valley (China), which remained free of ice, during last glaciation of Pleistocene (25,000–15,000 years ago). Not infrequently hybridizes with *P. domesticus* where one of the two species is rare and presumably has difficulty in finding mate of own species; hybrids with *P. hispaniolensis* also reported. Race *iubilaeus* is sometimes treated as synonym of *saturatus* and *obscuratus* as synonym of *dilutus*. Proposed race *zaissanensis* (from Kara Irtysh, in extreme E Kazakhstan) subsumed into *dilutus*, and *hepaticus* (from Mishmi Hills, in NW Asssam, in NE India) synonymized with *malaccensis*. Ten subspecies recognized.
Subspecies and Distribution.
P. m. montanus (Linnaeus, 1758) – from Europe E through NC Asia to Kamchatka and Commander Is, S to Mediterranean islands, Turkey, N Kazakhstan, NE Mongolia and NE China (N Inner Mongolia).
P. m. transcaucasicus Buturlin, 1906 – E Asia Minor and Caucasus region S to Armenia and E to N Iran (N of Elburz Mts).
P. m. dilutus Richmond, 1896 – Caspian Sea E to S Kazakhstan, NW China and W & S Mongolia.
P. m. kansuensis Stresemann, 1932 – N Gansu and Tsaidam Basin, in N China.
P. m. tibetanus Stuart Baker, 1925 – S & E Tibetan Plateau and C China (E to SE Qinghai and W Sichuan).
P. m. dybowskii Domaniewski, 1915 – E Asia from extreme SE Russia (lower R Amur) S to NE China (E Inner Mongolia and Liaoning) and N Korea.
P. m. iubilaeus Reichenow, 1907 – E China from Beijing S to E Sichuan and lower R Yangtze.
P. m. obscuratus Jacobi, 1923 – Nepal E to NE India.
P. m. malaccensis A. J. C. Dubois, 1885 – SE Asia from Myanmar E to Indochina and SE China (including Hainan), S to Malay Peninsula, Sumatra, Java, S Philippines, Sulawesi and Lesser Sundas.
P. m. saturatus Stejneger, 1885 – Sakhalin I, S Kurils, Japan, S Korea, Ryukyu Is, Taiwan, Philippines, N Borneo and N Indonesian islands.
Introduced (nominate race) in E USA, where now found in extreme EC Missouri and WC Illinois; also (probably *malaccensis*) in SE Australia, where now present SE Victoria and SE New South Wales (N to about Sydney).
Descriptive notes. 14–15 cm; 17–30 g. A small, neat-looking sparrow, unusual among the black-bibbed species in that sexes are virtually indistinguishable in the field. Nominate race has crown to nape chocolate-brown, ear-coverts and cheek white with prominent black patch, white extending across hindneck (giving white-collared appearance); black lores, black chin and central throat; upperparts yellowish-brown, mantle boldly streaked with black; tips of median and greater upperwing-coverts white (conspicuous double white wingbar); tail grey-brown, narrowly edged buffish; underparts off-white, flanks washed buffish; iris dark brown; bill blackish-horn, becoming black in breeding season; legs pale brown or pale pinkish-brown. Sexes alike. Juvenile is similar to adult, but duller. Races differ mainly in plumage tones, to lesser extent in size, those in more arid regions of Asia tend to be paler than nominate, those in tropical humid areas of SE darker (largest



birds occur at high altitudes, those from SE are smallest): *transcaucasicus* is less bright above and paler below than nominate; *dilutus* is palest race, more sandy in colour on upperparts; *kansuensis* is intermediate in colour between previous and *iubilaeus*; *tibetanus* is much larger than all others; *dybowskii* is distinguished by combination of dark plumage and small bill; *iubilaeus* is rather dark; *obscuratus* is intermediate between preceding race and *saturatus*; *saturatus* is darker and more richly coloured, bill larger than other races; *malaccensis* is similar to last but smaller, often with heavier streaking above. Voice. Basic call "chip", higher-pitched and quite distinct from similar call of *P. domesticus* (in sonagram shown to be disyllabic, as are calls of most of the sparrows, but this cannot be distinguished by ear in field), used by male to proclaim nest ownership, and elaborated into string of similar calls, e.g. "chip chip chicki, chip che chit, chippa-chippa chip", to form a song used for attracting a mate. Rhythmic series of soft calls ("social singing") given from deep cover by flock-members during rest period between feeding bouts. Threat call "tet-tet" or "trr"; alarm harsh, loud single or double "tät", but in mixed-species feeding flocks remains silent and relies on alarm calls of the other species. A series of soft calls is used between mates and between adult and young.

Habitat. In W of range (Britain) mainly in cultivated areas with hedgerow trees, orchards, gardens and farmyards, less commonly in light woodland; to the E is found increasingly not only in built-up areas, but also in open arid country. In Far East, where *P. domesticus* absent, common in built-up areas, occurring even in urban centres; occurs together with *P. domesticus* in Mongolia. In Europe seldom above 1500 m; reaches 4400 m in Asia.

Food and Feeding. Predominantly a seed-eater, preferring smaller seeds of low herbs and grasses, including cultivated cereals; also a significant proportion of animal food, particularly during breeding season. Nestling diet predominantly of insects and spiders (Araneae); mainly aphids (Aphidoidea) when chicks small, but also caterpillars (Lepidoptera), grasshoppers (Orthoptera) and beetles (Coleoptera), particularly weevils (Curculionidae). Bill length increases in summer, when higher proportion of soft insects in the diet (replacing hard seeds, which cause greater wear). Forages in pairs and in small groups; also in larger flocks in non-breeding season.

Breeding. Start of season depends on latitude, ranging from Apr or May in N of range to Jan in extreme S of Asia; up to four broods. Loosely colonial; also solitary. Nest built by both sexes, of dried grass and rootlets, lined with feathers and animal fur, domed (even when in a hole), with entrance on side, mostly in hole in tree, earth bank, cliff or artificial structure, sometimes in base of large nest of heron (Ardeidae), crow (Corvidae) or bird of prey; less frequently free-standing nest in tree, but then usually hidden in thick conifer or creepers. Clutch 2–7 eggs; incubation by both sexes, period 11–14 days; chicks fed by both parents, nestling period 15–20 days (the longer period being for young in nests in stone walls of wells, which have a difficult first flight); tends to be very secretive during breeding, slipping quietly off nest at approach of observer. Success among W European populations 45–75%. Breeding adults survive for average of two seasons, only rarely up to four seasons.

Movements. Mainly sedentary and partially migratory; small amount of dispersal, particularly of juveniles after breeding season. Minor proportion of population in Europe undertakes post-breeding migration S, but this of limited extent and seldom greater than 300 km. More pronounced movements in C Asia, with many migrating through Tien Shan passes and withdrawing S of breeding range. Birds in extreme N of range withdraw to S, and those living in countryside tend to move into built-up areas.

Status and Conservation. Not globally threatened. Widespread and locally numerous. Breeding densities in C Europe range from 10–40 birds/ha in open deciduous woodland to maximum of 3 birds/ha in built-up areas. Estimated European total in 1990s c. 15,000,000 breeding pairs. Population in Britain has fluctuated from a high of c. 1,500,000 individuals in late 1960s to c. 300,000 in 2002. Rough estimates for other European countries include Finland 10,000 birds (1989), Sweden 3,000,000 birds (1976), Netherlands 1,000,000–1,500,000 birds (1975), Germany 1,000,000–1,600,000 birds (2005), Belgium 420,000 birds (1968), France 200,000–2,000,000 birds (1976), Ireland 13,000–15,000 birds (1989). Has been expanding at limits of range, to N in Fennoscandia and to S in both S Europe and SE Asia; colonized Corsica, Sardinia and Malta in 20th century, recently colonized Gran Canaria, in Canary Is, and in last 100 years has spread S in Asia into Sumatra and Java, Borneo, Philippines and S Indonesia, these extensions probably partly aided by introductions. In contrast, there has been a significant decrease in numbers in Britain since 1980s, and in 1996 the species was placed on UK Red List of Species of National Conservation Concern, although some recovery recorded in early years of 21st century, with movement into farm buildings abandoned by *P. domesticus*; similar decline noted in Japan in late years of 20th century. Was perceived as a pest in China, and in 1958 a three-day campaign significantly reduced its numbers (an estimated 800,000 individuals killed in Beijing area alone), but this did not have desired effect of increasing rice harvest; campaign was abandoned, and the species quickly recovered its numbers. Nominate race was introduced in 1870 in St Louis (Missouri), in USA, from where it spread along Mississippi R into Illinois and now occupies area of 22,000 km² in extreme EC Missouri and WC Illinois; introduced (probably race *malaccensis*) in second half of 19th century in Melbourne, in SE Australia, from where spread to SE of Victoria and into New South Wales (N to about Sydney). Attempted introductions in New Zealand and Bermuda apparently unsuccessful. Possible introductions elsewhere.

Bibliography. Abé (1969), Amishima & Akatsuka (2009), Balát (1971, 1972a, 1972b, 1974, 1975, 1976), Berck (1961, 1962), Brazil (1991), Cheng Kwangmei & Huang Shawtsung (1965), Cheng Tsohsin (1987), Chia Hsiangkan *et al.* (1963), Clement *et al.* (1993), Cordero (1991, 1993), Cordero & Salaet (1990), Cordero & Summers-Smith (1993), Cramp & Perrins (1994), Creutz (1949), Deckert (1962, 1968, 1969), Fry & Keith (2004), García-Navas *et al.* (2008), Gauhl (1984), Grün (1975), Hagemeijer & Blair (1997), Hammer (1948), Han Suyin (1959), Hartert (1904), Hudde (1997c), Jurke (2007), Kirwan *et al.* (2008), Krištín (1984), McCarthy (2006), Noskov (1981), Ohta (2000), Pinowski (1965, 1966, 1967, 1968), Pinowski & Wójcik (1969), Roberts (1992), Schäfer (1938), Scherner (1972), Schönfeld (2001), Seel (1968a, 1968b, 1970), Stepanyan (2003), Stephan (1965a), Summers-Smith (1988, 1989, 1995, 1998), Ward & Poh (1968).

24. Sudan Golden Sparrow

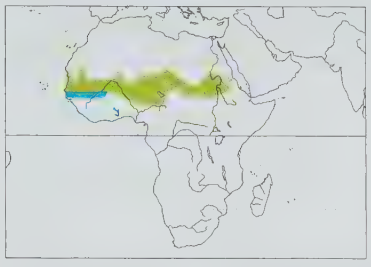
Passer luteus

French: Moineau doré **German**: Braunrücken-Goldsperling **Spanish**: Gorrión Dorado
Other common names: Golden Sparrow

Taxonomy. *Fringilla luteus* M. H. C. Lichtenstein, 1823, Dongola, northern Sudan.

This species and *P. euchlorus* formerly placed in a separate genus, *Auripasser*. The two form a superspecies and in the past were often treated as conspecific; some authorities include *P. eminibey* in this superspecies, but this appears not to be justified. Monotypic.

Distribution. Narrow zone in Sahel zone from Mauritania and N Senegal E to Red Sea coast of Sudan.



Descriptive notes. 12–13 cm; 11–16 g. Male has golden-yellow head and underparts, often grey feather tips on ear-coverts; mantle, scapulars and back chestnut, rump yellowish-grey; median and outer greater upperwing-coverts black, tipped white (prominent double wingbar), inner greater coverts mostly chestnut, flight-feathers blackish, edged warm brown to rufous, small pale patch at base of primaries; tail brown, feathers edged paler; iris dark brown; bill horn-coloured, becoming black in breeding season; legs flesh-pink or pinkish-brown. Female has top of head and upperparts sandy brown, face and underparts pale creamy yellow, pale yellowish-buff supercilium, wing like that of male but browner, wingbars dull buff. Juvenile is similar to female, but with grey flecks on back of head and nape, and lighter below; first-year male paler than adult. Voice. Call of male at nest a disyllabic "chitta". Song a high-pitched chittering containing up to 20 notes; at large colonies, song of males loud enough to be heard over engine noise when observer driving past in a car. Twittering flight call resembles that of a cardueline finch. Threat a long drawn-out rattle or "churr"; female invites copulation with soft "dee"; chicks beg with quiet "dipp".

Habitat. Arid sandy savannas with low density of trees and shrubs, and with seasonal ground cover of low annual plants.

Food and Feeding. Primarily seeds of grasses and the smaller seeds of cultivated cereals such as millet; small amount of animal matter. Nestlings fed with invertebrates, including bugs (Hemiptera), caterpillars of Lepidoptera, weevils (Curculionidae) and locust larvae (Acrididae). Gregarious; in large flocks, often with other species, e.g. weavers (Ploceidae).

Breeding. Breeding opportunistic, coinciding with rains; one or two broods. Highly colonial; in dispersed colonies of up to 65,000 nests, with densities of 20–570 nests/ha; single large tree can hold up to 30 nests. Nest built by both sexes, with stiff dead twigs woven into branches of tree, side entrance spiralling down to nest-chamber, placed in thorny tree where emergent ground vegetation present; for second brood, builds new nest at new site where conditions favourable, but not known if partners remain together to breed there. Clutch 3–4 eggs; incubation by both sexes, period 10–12 days; chicks fed by both parents, nestling period 13–14 days (suited to short periods when flush of insects persists).

Movements. Highly nomadic, occurrence coinciding with ripening of seeds, but less so in areas where irrigation and cultivation practised. Outside breeding season occurs in small numbers S of breeding range, e.g. in Gambia.

Status and Conservation. Not globally threatened. Common to locally abundant. Breeding range normally lies between 100 mm and 500 mm isohyets (rainfall contours), but in irrigated areas also below the 100 mm limit; for example, has spread N into extreme S Algeria (I-n-Guezzam), presumably because of irrigated farming in area. During the Sahelian drought, which began c. 1968 and lasted for c. 14 years, breeding range shifted S (following the drift of the limiting isohyets). Can become a pest species in cultivated cereals, but, despite extensive control operations, maintains its numbers. In studies in Niger in 1980s, however, this species was found not to damage rice fields, because it preferred to take seeds from ground; moreover, it consumes injurious insects and feeds nestlings with locusts, and should therefore not be considered a pest, although it can have small adverse impact locally.

Bibliography. Ash & Atkins (2009), Borrow & Demey (2001), Bruggers & Bortoli (1976), Clement *et al.* (1993), Cramp & Perrins (1994), Fry & Keith (2004), Jacob & de Schaetzen (1984), Jones (1976), Klein (1988, 1989, 1992), Kunkel (1961), McCarthy (2006), Morel & Morel (1973a, 1973b, 1976, 1978), Neunzig (1928), Nikolaus (1987), Oubron (1967), Redman *et al.* (2009), Ruelle & Semaille (1982), Summers-Smith (1988).

25. Arabian Golden Sparrow

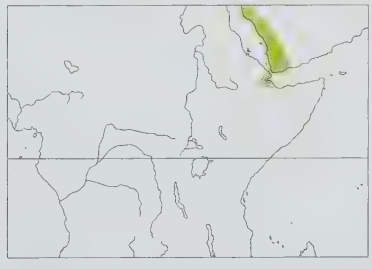
Passer euchlorus

French: Moineau d'Arabie **German**: Jemengoldsperling **Spanish**: Gorrión Árabe

Taxonomy. *Auripasser euchlorus* Bonaparte, 1850, "Abyssinia, Arabia" = Kunfuda, Arabia.

This species and *P. luteus* formerly placed in a separate genus, *Auripasser*. The two form a superspecies and in the past were often treated as conspecific; some authorities include *P. eminibey* in this superspecies, but this appears not to be justified. Monotypic.

Distribution. SW tip of Arabian Peninsula, and Djibouti and extreme coastal NW Somalia.



Descriptive notes. 12–13 cm; 12–17 g. Male is golden-yellow, except for paler yellow upperwing-coverts with greyish inner webs, black flight-feathers with whitish edges, small white patch at base of primaries, black tail feathers broadly edged white; iris dark brown; bill flesh-coloured to creamy grey, becoming black in breeding season; legs pale pinkish-brown. Female is mainly pale buff or sandy grey, pale lemon-buff below; with wing and tail similar to male's. Juvenile is similar to female, but with faint spotting on upperparts. Voice. Soft, disyllabic, high-pitched chirp, similar to that of *P. luteus*. Flocks utter continuous soft twittering.

Habitat. Arid thornbush savanna and nearby cultivated land.

Food and Feeding. Seeds of grasses and cultivated cereals, especially millet; little recorded. Highly gregarious, forages in small flocks; larger flocks, sometimes of thousands, in non-breeding season.

Breeding. Breeding probably associated with rains, recorded in Mar–Jul in Yemen and Mar–May in Djibouti. Highly colonial, with 20–30 nests in one tree. Nest a compact oval structure, domed, with entrance on side, made from thin acacia (*Acacia*) twigs, lined with plant fibres and feathers, placed 2–3 m above ground in tree, typically acacia, with nest worked into the branches. Clutch 4–6 eggs; incubation by female, chicks fed by both sexes; no information on duration of incubation and nestling periods.

Movements. Mainly sedentary; small local movements in non-breeding season.

Status and Conservation. Not globally threatened. Common. Largely dependent on cultivated crops; not directly controlled by man, but breeding area may be abandoned after a few years, the birds moving to a new location. Could possibly be put at risk through removal of trees on which it depends for cover and breeding. Presence in Africa is result of recent expansion of range, possibly resulting from escaped cagebirds; is still spreading W, the gap between it and *P. luteus* having decreased from 650 km in 1970 to less than 50 km in 2000.

Bibliography. Al-Safadi & Kasparek (1995), Archer & Godman (1961), Ash (1980), Ash & Atkins (2009), Ash & Miskell (1983, 1998), Bowden (1987), Clement *et al.* (1993), Fry & Keith (2004), Meinertzhagen (1954), Neunzig (1928), Porter *et al.* (1996), Redman *et al.* (2009), Ruelle (1992a).

26. Chestnut Sparrow

Passer eminibey

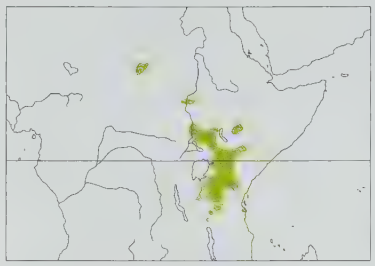
French: Moineau d'Emin **German**: Maronensperling **Spanish**: Gorrión Castaño
Other common names: Emin Bey's Sparrow

Taxonomy. *Sorella eminibey* Hartlaub, 1880, Lado, northern Uganda.

Formerly placed in a monotypic genus, *Sorella*. Has been placed in the superspecies formed by *P. luteus* and *P. euchlorus*, but this arrangement considered doubtfully valid. Monotypic.

Distribution. W, SE & S Sudan, S Ethiopia, N & NE Uganda and much of Kenya S to NE, C & E Tanzania.

Descriptive notes. 10·5–11·5 cm; 12–17 g. Male is dark chestnut, becoming darker and browner on face; blackish-brown wing and tail with chestnut edges, small pale patch at base of primaries; iris dark brown; bill black or blackish; legs pale brown. Female has head to upper mantle grey-brown, chestnut-buff supercilium, chestnut chin and centre of throat, chestnut-brown lower mantle and scapulars streaked dark brown, back to uppertail-coverts more rufous; tail and wing similar to male's, but edges paler and buffer; chest dull chestnut, becoming buff on belly and flanks; bill paler than male's. Juvenile is similar to female but paler, with chestnut reduced to tinge on rump and lesser upperwing-coverts (chestnut almost entirely absent on throat and face); immature male becomes blotched with chestnut, and may even breed in this plumage. Voice. Song thin, high-pitched "tchiweeza tchiweeza tchi-tchi-tchi-tchi see-see-see-see-seerichi"; threat a dry scolding "chrrrrit" or "chrrreerrrrrrrr"; flight call ringing "chew chew".



Habitat. Dry acacia (*Acacia*) savanna near swamps or habitations, up to 2200 m.

Food and Feeding. Mostly granivorous, taking seeds of grasses and weeds; also household scraps. Nestlings fed with insects, including small beetles (Coleoptera), and soft grass seeds. Feeds on ground. Forages in small groups and in flocks; also singly and in pairs.

Breeding. Breeding coincides with rains and can take place at any time of year, apparently stimulated by breeding activity of weavers (Ploceidae). Colonial, with most unusual behaviour; sometimes in single-species colony, and sometimes in mixed colony with e.g. Speke's (*Ploceus spekei*) and Lesser Masked Weavers (*Ploceus intermedius*) and/or Grey-capped Social Weaver (*Pseudonigrita arnaudi*). Nest an untidy globular structure with side entrance, built from dry grass, lined with feathers, placed in branches of tree; often old abandoned nest of weaver, including aforementioned species, used; sometimes, in mixed colony with weavers, uses old nests of latter or ejects owners from occupied nest (in some colonies, ejection of owners was the sole strategy); suggested that present species is evolving from normal breeder into nest parasite. Clutch 3–4 eggs; in captivity, incubation period 18–19 days; chicks possibly fed by female alone, no information on duration of nestling period.

Movements. Nomadic, wandering extensively in large flocks outside breeding season.

Status and Conservation. Not globally threatened. Local, but common.

Bibliography. Ash & Atkins (2009), Betts (1966), Britton (1980), Brooker (1986), Brown & Britton (1980), Clement *et al.* (1993), Dorn (1980), Friedmann (1937), Fry & Keith (2004), Mackworth-Praed & Grant (1960), Neunzig (1928), Nikolaus (1987), Payne (1969), Redman *et al.* (2009), Ruelle (1992a), Summers-Smith (1988), Williams & Arlott (1980), Zimmerman *et al.* (1996).

PLATE 51 ➤


27
ssp pyrgita
ssp pallida
28
29
♂
♀
31
♂
♀
30
ssp petronia
ssp puteicola
32
34
inches 3
cm 8
PLATE 51
♂
ssp nivalis
♀
33
♂
ssp alpicola
♂
ssp kwenlunensis
35
36
37
ssp blanfordi
ssp ventorum
39
♂
40
♀
38

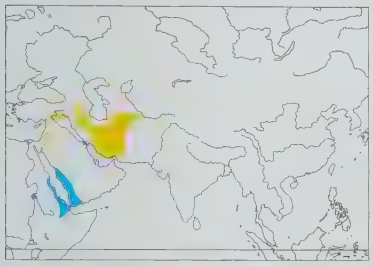
Genus *CARPOSPIZA* J. W. von Müller, 1854

27. Pale Rock-sparrow

Carpospiza brachydactyla

French: Moineau pâle **German**: Fahlsperling **Spanish**: Gorrión Pálido
Other common names: Pale Rockfinch/Petronia, Hill Sparrow

Taxonomy. *Petronia brachydactyla* Bonaparte, 1850, "Abyssinia, Arabia" = Kunfuda, western Arabia.
Genus often subsumed into *Petronia*. This species, however, differs strikingly from other rock-sparrows, and considered by some authorities to be a cardueline finch (Fringillidae); similar to latter in breeding details (nest, eggs, appearance of nestling), in having only partial juvenile moult and in song, but differs in details of cranium; affinity to sparrows supported by structure of horny palate and digestive tract. Further study required. Monotypic.
Distribution. Breeds SE Turkey, N Middle East, erratically in Saudi Arabia and United Arab Emirates, and Armenia E to Iran, Turkmenistan and W Afghanistan.



Descriptive notes. 13·5–14·5 cm; 21–25 g. Slim, generally rather featureless sparrow with short and stout bill; in flight, long triangular-shaped wings reminiscent of a lark (Alaudidae). Has top of head light sandy grey, poorly defined pale supercilium and area under eye; side of head pale greyish-brown, paler moustachial stripe, contrasting darker malar streak; upperparts light sandy grey, slightly darker on uppertail-coverts; upperwing mostly dark brown, median and greater coverts with broad buff tips (double buff wingbar), flight-feathers with pale sandy edges and tips (pale panel on secondaries); tail rather dark grey-brown, feathers narrowly edged paler, tips of all except central pair white; chin and throat whitish to pale buff, breast and upper flanks darker, buffish-grey, rest of underparts white with variable light buff wash; iris dark brown; bill pale brown; legs bright orange-brown. Sexes alike. Juvenile is similar to adult, but paler. Voice. Call a high-pitched nasal "twee", "zweee" or "twee-oo"; song monotonous insect-like buzzing "tss tss tss tsseeeeeee", usually from top of rock or bush. Soft trill or churr in flight; during nest-building and incubation, partners give duetting calls near nest.
Habitat. Arid regions with sparse bushy vegetation, often in sparsely grassed hilly and mountainous areas, and rocky ravines; to 3000 m. Occurs in open cultivated land in non-breeding quarters.
Food and Feeding. Mostly plant matter, especially seeds, including those of cultivated cereals, and green parts of plants; also insects in breeding season. Nestlings fed mainly with caterpillars and small cicadas (Cicadidae). Forages on ground and among low vegetation. In pairs and in small, loose groups; larger flocks in non-breeding season.
Breeding. Thought to be an opportunistic breeder, following exceptional rains, Mar in S of range to Jul in N; single-brooded. In loose colonies. Nest an open, bulky, untidy hemisphere of thorny twigs, plant stems and grass, lined with plant down and animal hair, placed in bush or sometimes in crevice in rock or hole in building. Clutch 3–6 eggs, generally 4–5; incubation by female alone, period 13–14 days; chicks fed by both parents, nestling period 11–16 days.
Movements. Migratory. Non-breeding quarters mainly in W Saudi Arabia and NE Africa (EC & E Sudan, Eritrea, Djibouti and N Ethiopia), occasionally in S Israel, Egypt and Oman. Departure from breeding quarters mid-Jul to mid-Aug; leaves non-breeding grounds from middle of Feb, peak passage mid-Mar to mid-April in much of Arabia and sometimes large flocks recorded (e.g. 1200 in mid-Mar in United Arab Emirates); arrival in breeding areas mostly in second half May.
Status and Conservation. Not globally threatened. Locally common, and abundant in some parts of range. Flocks of several hundreds can pose a threat as a pest of cereal (millet) cultivation.
Bibliography. Adamyan (1965), Ash & Atkins (2009), Bock (2004), Clement *et al.* (1993), Cramp & Perrins (1994), Dementiev *et al.* (1954, 1970), Flint *et al.* (1984), Gallagher & Woodcock (1980), Griffin *et al.* (2001), Hüe & Étchécopar (1970), Ivanitskii (1986, 1997), Kirwan (1998), Kirwan *et al.* (2008), Knight & Beale (2004), Mackworth-Praed & Grant (1960), Patrikeev (2004), Porter *et al.* (1996), Rasmussen & Anderton (2005b), Redman *et al.* (2009), Scott *et al.* (1975), Shirihai (1996), Stepanyan (2003), Vaurie (1959), Zusi (1978).

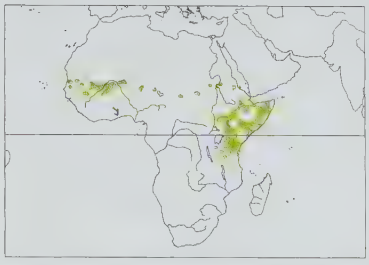
Genus *GYMNORIS* Blyth, 1845

28. Yellow-spotted Bush-sparrow

Gymnoris pyrgita

French: Moineau à point jaune **German**: Sahelsteinsperling **Spanish**: Gorrión Moteado
Other common names: Yellow-spotted Petronia/Rock-sparrow, Abyssinian Yellow-throated Petronia, Sudan Rock-sparrow/Petronia

Taxonomy. *Xanthodina pyrgita* Heuglin, 1862, Bogos Mountains, slopes of the Barca valley, Eritrea.
Genus often subsumed into *Petronia*. Forms a superspecies with *G. xanthocollis*, and sometimes treated as conspecific. Two subspecies recognized.
Subspecies and Distribution.
G. p. pallida Neumann, 1908 – S Mauritania and W Senegal E, very patchily, to C Sudan.
G. p. pyrgita (Heuglin, 1862) – Eritrea, SE Sudan, S Ethiopia and Somalia S to NE Uganda, Kenya and N Tanzania.



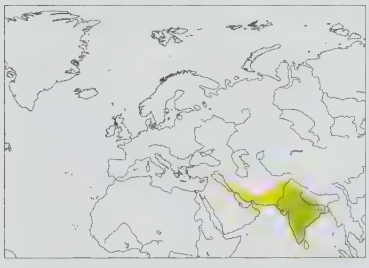
Descriptive notes. 15–16 cm; 21–28·5 g. Nominate race is unstreaked ash-grey to ashy brown above, with indistinct narrow light buff supercilium, white ring around eye, cheek dusky brown; tail dark brown with greyish-buff edges to outer feathers; chin and throat whitish, yellow spot on lower throat (often difficult to see in field); breast greyish, rest of underparts plain dirty white, belly paler; iris dark brown; bill pinkish-horn; legs blue or bluish-grey. Sexes similar, throat spot of female sometimes less distinct than male's. Juvenile is similar to adult, but somewhat browner, with more conspicuous supercilium, and some streaking on back. Race *pallida* is paler and sandier above and clearer white below than nominate. Voice. Calls include shrill "tyit", "tyeet" and "chillip", and lower-pitched, chirping "tlooey-tlooey" or "cherp-cherp"; song a simple "chiew-chiew-chiew-chiew-tcheep".
Habitat. Dry savanna, acacia (*Acacia*) steppe and open woodland, gardens and cultivated land with trees; to 1800 m. Some preference for rocky ground, but seen more often in trees than on ground.
Food and Feeding. Berries of toothbrush tree (*Salvadora persica*), seeds; also insects, including beetles (Coleoptera). Forages on ground, but probably equally or more in trees; searches for insects in trees in manner of a tit (Paridae). Forages in pairs and small groups; often in company of small weavers (Ploceidae).
Breeding. Mainly Jun–Aug in W of range, May in Somalia and Mar–Apr in Kenya and Tanzania, coinciding with rains. Solitary. Nest a pad of hair, feathers and other soft material, placed in hole in tree branch, stump or sand cliff. Clutch 3–5 eggs. No other information.
Movements. Nomadic outside breeding season.
Status and Conservation. Not globally threatened. Common; apparently very local in much of range.
Bibliography. Ash & Atkins (2009), Borrow & Demey (2001), Britton (1980), Brown & Britton (1980), Clement *et al.* (1993), Dickinson (2003), Friedmann (1937), Fry & Keith (2004), Grant & Mackworth-Praed (1944a), Hall & Moreau (1970), Mackworth-Praed & Grant (1960), Nikolaus (1987), Redman *et al.* (2009), Williams & Arlott (1980).

29. Chestnut-shouldered Bush-sparrow

Gymnoris xanthocollis

French: Moineau à gorge jaune **German**: Gelbkehlsperling **Spanish**: Gorrión Cuelligualdo
Other common names: Chestnut-shouldered Petronia/Sparrow, Yellow-throated Sparrow/Rock-sparrow/Petronia

Taxonomy. *Fringilla xanthocollis* E. Burton, 1838, Ganges between Calcutta and Benares, India.
Genus often subsumed into *Petronia*. Forms a superspecies with *G. pyrgita*, and sometimes treated as conspecific. Two subspecies recognized.
Subspecies and Distribution.
G. x. transfuga E. J. O. Hartert, 1904 – SE Turkey, SE Iraq, SW Afghanistan and S Pakistan; possibly also the Syrian Euphrates.
G. x. xanthocollis (E. Burton, 1838) – E Afghanistan and N Pakistan E to S Nepal, and most of India.



Descriptive notes. 12·5–14 cm; 14–20 g. Smallish drab sparrow with comparatively long and slender bill. Male nominate race is mainly olive grey-brown above and pale brown to whitish below, unstreaked; can have faint pale supercilium (often more marked in female); small, rather inconspicuous pale yellow spot on lower throat; chestnut patch on forewing, two prominent white wingbars; tail slightly notched at tip, dark grey with thin paler buffy edges; iris dark brown; bill horn-coloured, becoming black in breeding season; legs grey or grey-brown. Female is like male but duller, lacks yellow throat spot and chestnut forewing; bill yellowish-horn, paler at base. Juvenile resembles female. Race *transfuga* is paler, more sandy, than nominate. Voice. Chirping calls, similar to "chilp" or chirrup" of *Passer domesticus* but softer and more tuneful; song, given for long periods from favoured perch, a rhythmic "chilp chalp cholp", more melodious and faster than that of *P. domesticus*.
Habitat. Open country and low hills with trees, river bottoms with trees, and scrub-jungle, also cultivated areas with scattered trees or hedgerows, villages and inhabited areas with gardens. To 1500 m.
Food and Feeding. Plant material, mainly seeds, including those of cultivated cereals, also small berries and nectar (forehead often discoloured golden by pollen); in breeding season also insects, mainly weevils (Curculionidae), caterpillars, grasshoppers (Orthoptera) and ants (Formicidae). Nestlings fed with insects. Forages in trees, but mostly on ground. Gregarious; in pairs and small groups, with larger flocks outside breeding season.
Breeding. Apr–Jul in Afghanistan and mainly Feb–May in India; two broods. Solitary or in small groups. Nest built by female, ranges from being a small pad of hair, feathers and grass to being an untidy mass of dry grass, wool and hair, lined with feathers, that fills cavity in which placed, mainly in covered site, including crevice in tree or hole in wall or building, also in old nest of other species. Clutch 3–4 eggs, occasionally 5; incubation by female alone, chicks fed by both sexes; no information on duration of incubation and nestling periods.
Movements. In NW & N of range, from Turkey E to Pakistan and N India, a summer visitor; in S a partial migrant, some moving to S of breeding range in winter. Also nomadic, making local movements apparently in response to rain. Vagrant in Malta, Israel and Sri Lanka.

On following pages: 30. Yellow-throated Bush-sparrow (*Gymnoris superciliaris*); 31. Russet-browed Bush-sparrow (*Gymnoris dentata*); 32. Common Rock-sparrow (*Petronia petronia*); 33. White-winged Snowfinch (*Montifringilla nivalis*); 34. Black-winged Snowfinch (*Montifringilla adamsi*); 35. Tibetan Snowfinch (*Montifringilla henrici*); 36. White-rumped Ground-sparrow (*Pyrgilauda taczanowskii*); 37. Small Ground-sparrow (*Pyrgilauda davidiana*); 38. Rufous-necked Ground-sparrow (*Pyrgilauda ruficollis*); 39. Blanford's Ground-sparrow (*Pyrgilauda blanfordi*); 40. Afghan Ground-sparrow (*Pyrgilauda theresae*).

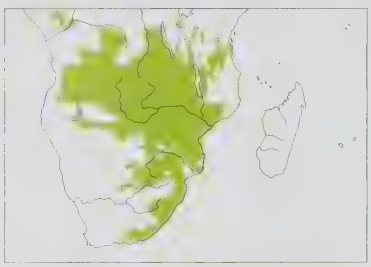
Status and Conservation. Not globally threatened. Common; locally abundant in Indian Subcontinent.
Bibliography. Ali & Ripley (1974), Clement *et al.* (1993), Cramp & Perrins (1994), Dickinson (2003), Fleming *et al.* (1979), Gallagher & Woodcock (1980), Hüe & Etchécopar (1970), Kirwan *et al.* (2008), Murdoch (2005), Porter *et al.* (1996), Rasmussen & Anderton (2005b), Roberts (1992), Scott *et al.* (1975), Vaurie (1959).

30. Yellow-throated Bush-sparrow

Gymnoris superciliaris

French: Moineau bridé **German**: Kapsteinsperling **Spanish**: Gorrión Cejudo
Other common names: Yellow-throated Petronia, (Southern) Yellow-throated Sparrow, South African Petronia/Rock-sparrow

Taxonomy. *Gymnorhis* [sic] *superciliaris* Blyth, 1845, Cape Town, South Africa.
Genus often subsumed into *Petronia*. Geographical variation rather poorly marked; species sometimes treated as monotypic. Proposed race *oraria* (described from Magogoni, inland from Dar es Salaam, in E Tanzania) is synonymous with *hororensis*. Four subspecies recognized.
Subspecies and Distribution.
G. s. rufitergum (Clancey, 1964) – extreme SE Gabon, S PRCongo and SW & S DRCongo E to SW Tanzania, S to Angola, NE Namibia and NW Botswana.
G. s. flavigula (Sundevall, 1850) – SE Zambia, Zimbabwe, E Botswana and N South Africa.
G. s. hororensis (Roberts, 1912) – E Tanzania S to Mozambique, NE South Africa (E Limpopo Province and NE KwaZulu-Natal) and E Swaziland.
G. s. superciliaris Blyth, 1845 – E South Africa (KwaZulu-Natal S to Eastern Cape).



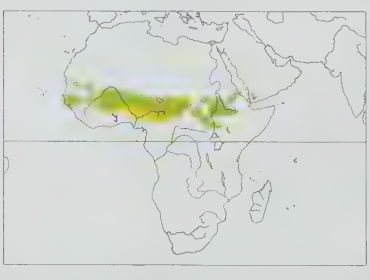
Descriptive notes. 15–16 cm; 22–30 g. Nominate race is dusky brown above, with prominent broad whitish-buff supercilium from just in front of eye broadening out towards nape, bordered below by blackish-brown eyestripe behind eye and curving down behind ear-coverts; back streaked dusky, upperwing-coverts tipped pale buffish; tail dark brown with narrow pale or warm buffish-brown edges; chin whitish, throat white, inconspicuous yellow spot on lower throat; underparts brownish-grey, becoming off-white in centre of belly; iris dark brown; bill robust, brown with paler lower mandible; legs dark grey. Sexes alike. Juvenile is like adult, but generally warmer brown, with supercilium buffish, and lacks yellow throat spot. Races differ mainly in colour of upperparts: *hororensis* is more buffy above; *flavigula* is somewhat paler; *rufitergum* is tinged rufous. Voice. Calls include disyllabic "chlee-chlee" or "chew-chew", and single "pick" or "peek"; song a series of tuneless chirping notes (up to 7 in a series), "tyee-tyee-tyee" or "tyoo-tyoo-tyoo-tyoo", or faster "chichichichichichichew". Low chatter/scold presumably used in threat.
Habitat. Widespread in woodland, savanna, riverine bush and cultivated land, especially in hilly districts; to 1500 m, occasionally higher.
Food and Feeding. Seeds, nectar and insects. Forages on ground, but more usually in higher branches of trees. Singly, in pairs and in small groups; small flocks outside breeding season.
Breeding. Season Aug–Nov in DRCongo, Zambia, Zimbabwe and N South Africa (Limpopo), Oct–Nov in Mozambique, Oct–Jan in E South Africa and Jan–Feb in Namibia, coinciding with rains. Solitary. Nest a loose ball of grass with thick lining of feathers, placed in shallow hole in tree. Clutch 3–4 eggs; incubation by female alone, period 17 days; chicks fed by both parents, nestling period 18–19 days.
Movements. Resident; some local wandering outside breeding season.
Status and Conservation. Not globally threatened. Common to locally uncommon. Density up to 16 birds/ha. Estimated population in Swaziland 4000 individuals and in S Mozambique 50,000 individuals.
Bibliography. Benson & Benson (1977), Benson *et al.* (1973), Borrow & Demey (2001), Britton (1980), Brown & Britton (1980), Chapin (1954), Clancey (1971a), Clement *et al.* (1993), Dickinson (2003), Dowsett *et al.* (2008), Fry & Keith (2004), Harrison *et al.* (1997), Hockey *et al.* (2005), Mackworth-Praed & Grant (1963), Maclean (1985).

31. Russet-browed Bush-sparrow

Gymnoris dentata

French: Petit Moineau **German**: Buschsteinsperling **Spanish**: Gorrión Chico
Other common names: Bush Petronia/Sparrow, Lesser Petronia/Rock-sparrow

Taxonomy. *Xanthodira dentata* Sundevall, 1850, Ronga [=Abu Saad], on Blue Nile, Sudan.
Genus often subsumed into *Petronia*. Race *buchanani* rather weakly differentiated; species sometimes treated as monotypic. Two subspecies recognized.
Subspecies and Distribution.
G. d. dentata (Sundevall, 1850) – S Mauritania and Senegambia E in Sahel zone and savanna belt (except S Niger) to S Sudan, W Ethiopia and N Eritrea; also SW Arabia (S Yemen).
G. d. buchanani E. J. O. Hartert, 1921 – S Niger (Zinder province E to L Chad).



Descriptive notes. 13 cm; 16–21·5 g. Fairly small sparrow with relatively short tail and long conical bill. Male nominate race is mainly dark brown above, with grey crown separated from grey ear-coverts and cheek by russet supercilium extending from eye to side of nape and down side of neck; rather indistinct pale tip on upperwing-coverts; tail dark grey or greyish-brown, with narrow pale edges and buffish to buffy-white tips; chin and throat creamy white, inconspicuous small pale yellow spot on lower throat; underparts off-white, breast and flanks washed grey; iris dark brown; bill brown with paler-horn base, becoming black in breeding season; legs grey, bluish-grey or brown-tinged greyish. Female is similar to male, but with crown browner, supercilium cream, dark streaks on back, yellow throat spot reduced or lacking. Juvenile is like female, but upperparts more tawny-brown and supercilium tawny-buff. Race *buchanani* is paler than nominate. Voice. Calls chirping; song slightly rolled "chru-chru-chru-chru-chru-chru-chru", similar to that of *G. superciliaris* but lower-pitched and drier.
Habitat. Dry and arid areas, wooded savanna to light woodland, and cultivated clearings in vicinity of towns, to 1500 m; to 1900 m in Yemen.
Food and Feeding. Small seeds and insects. Obtains food items both from the ground and by searching branches and leaves on trees. Spends most of time in trees. Singly, in pairs and in small groups; sometimes larger concentrations at food sources.
Breeding. Season Nov–Mar over most of range. Solitary. Nest cup-shaped, placed in hole in tree or post or crevice in tree, occasionally a shapeless mass of grass in tree branches; often in old hole of woodpecker (Picidae) in Yemen. No other information on wild populations; in captivity, clutch 2–3 eggs, incubation by both sexes, mainly female, period 14–17 days, chicks fed by both parents, nestling period 13 days.
Movements. Resident and local migrant, wandering widely outside breeding season.
Status and Conservation. Not globally threatened. Uncommon to locally fairly common in W of range; frequent to common in E, and locally abundant in Eritrea.
Bibliography. Ash & Atkins (2009), Borrow & Demey (2001), Clement *et al.* (1993), Dickinson (2003), Fry & Keith (2004), Hall & Moreau (1970), Mackworth-Praed & Grant (1973), Nikolaus (1987), Porter *et al.* (1996), Redman *et al.* (2009), Trollope (1977).

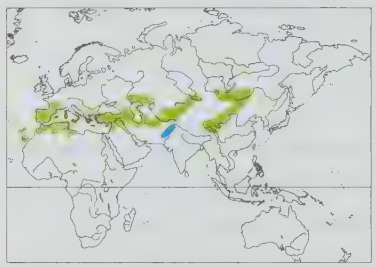
Genus *PETRONIA* Kaup, 1829

32. Common Rock-sparrow

Petronia petronia

French: Moineau soulcie **German**: Steinsperling **Spanish**: Gorrión Chillón
Other common names: Rock Sparrow/Petronia, Eurasian/European/Streaked Rock-sparrow

Taxonomy. *Fringilla Petronia* Linnaeus, 1766, northern Italy.
Somewhat smaller birds from Caspian region E to Kyrgyzstan sometimes treated as additional race *kirhizica*, but differences from *intermedia* appear insufficient to justify separation. Six subspecies recognized.
Subspecies and Distribution.
P. p. petronia (Linnaeus, 1766) – Madeira, Canary Is, and S Europe (including Mediterranean islands) E to Bulgaria and W Asia Minor.
P. p. barbara Erlanger, 1899 – Morocco E to NW Libya (S to 21° N).
P. p. exigua (Hellmayr, 1902) – C Turkey E to Caucasus, N Iraq and N Iran (E to Gorgan).
P. p. puteicola Festa, 1894 – S Turkey S to C Israel, Syria and W Jordan.
P. p. intermedia E. J. O. Hartert, 1901 – lower Volga valley E to Aral Sea and E Kazakhstan, Kyrgyzstan, S to SW & NE Iran, N Afghanistan and extreme NW China (W Xinjiang).
P. p. brevirostris Taczanowski, 1874 – S foothills of Altai, N & E Mongolia and SE Transbaikalia S to N & C China (Inner Mongolia S to N Sichuan).



Descriptive notes. 14–15·5 cm; 26–39 g. Stout sparrow with short, square tail and robust bill; in flight, broad wings and short, white-tipped tail characteristic. Nominate race is mainly greyish-brown, heavily streaked darker brown above and below; head boldly striped, with pale crown, dark brown lateral crownstripe, and conspicuous buffy-white stripe extending back from eye and bordered below by dark line behind eye; upperparts brown with darker brown streaking; tail with white spots on tip; whitish below, inconspicuous yellow spot on lower throat (not easy to see in field), underparts streaked grey-brown; iris dark brown; bill horn to dark brown above, almost entirely horn-yellow below; legs pale brown or pinkish-brown. Sexes alike. Juvenile is browner than adult, duller below, lacks yellow throat spot. Race *barbara* is paler and greyer than nominate; *exigua* is intermediate between nominate and previous; *puteicola* is larger than nominate, palest race, streaking on underparts much less obvious; *intermedia* is intermediate between nominate and last; *brevirostris* has shorter and heavier bill. Voice. Noisy. Large variety of mainly disyllabic, rather nasal calls, e.g. "pee-yee" or "jee-wee"; song a loose collection of up to 50 varied call notes. Threat a chattering "terrettettet", similar to that of *Passer domesticus*.
Habitat. Generally bare treeless country, ranging from flat desert steppe to rocky slopes and ravines at up to 4800 m; in Spain, common in open woodland or parkland, e.g. of maritime pine (*Pinus pinaster*). Frequently forages in large open areas of cultivation, vineyards, olive groves, near old buildings and even penetrates into human settlements.
Food and Feeding. Mainly seeds of low herbs and grasses, also small berries; in breeding season also animal matter, e.g. termites (Isoptera) and beetles (Coleoptera), taking larger prey than do members of *Passer*. Nestlings fed mainly with invertebrates, especially caterpillars of Lepidoptera and grasshoppers (Orthoptera). Food collected mostly on the ground, but some insects caught in flight. In pairs and in small flocks, often in larger flocks.
Breeding. Season Mar–Aug; two broods. In loose colonies and isolated pairs. Nest an untidy structure, sometimes domed, made from grass, lined with feathers, animal hair and wool, placed in crack or crevice in rock or tree, or in wall or roof of isolated and ruined building, occasionally in occupied building, material filling cavity in which nest built. Clutch 4–7 eggs, occasionally 8; incubation by female only, period 11–14 days; chicks fed by female, male sometimes taking minor role, nestling period 18–19 days.
Movements. Resident and partial migrant; some post-breeding dispersal and withdrawal to lower altitudes in winter. Race *intermedia* found in winter also in S Afghanistan, Kashmir and N Pakistan.
Status and Conservation. Not globally threatened. Common. European population in 1980s estimated at c. 1,000,000 pairs, mostly in Spain, where breeding densities of 1·6 birds/10 ha in uncultivated land but merely 0·02 birds/10 ha in cropland; highest densities (up to 1·73 birds/10 ha) in open woodland/parkland. Recent contraction from N parts of range, although Spanish population thought to be stable during late 1990s; decrease in numbers in Madeira and Canary Is, the latter presumed to be result of competition from introduced *Passer hispaniolensis*; probably increasing in Balkans.

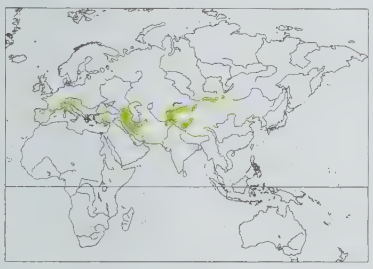
Bibliography. Biddau *et al.* (1995), Cheng Tsohsin (1987), Clement *et al.* (1993), Cramp & Perrins (1994), Dickinson (2003), Dittberner & Kage (1991), Fiebig & Jander (1987), Fry & Keith (2004), Fu Tongsheng *et al.* (1998), Griggio, Matessi & Pilastro (2003), Griggio, Tavecchia *et al.* (2003), Haffer (1997b), Hagemeijer & Blair (1997), Ivanitskii (1985, 1986), Kirwan *et al.* (2008), Martí & del Moral (2003), Matessi *et al.* (2007), Nankinov (1985), Niethammer (1967), Patrikeev (2004), Piechocki & Bołod (1972), Purroy (1997), Rasmussen & Anderton (2005b), Roberts (1992), Schäfer (1938), Scott *et al.* (1975), Stepanyan (2003), Thévenot *et al.* (2003), Vaurie (1959, 1972).

Genus *MONTIFRINGILLA* C. L. Brehm, 1828

33. White-winged Snowfinch
Montifringilla nivalis

French: Niverolle alpine **German**: Schneesperling **Spanish**: Gorrión Alpino
Other common names: Eurasian/Common Snowfinch

Taxonomy. *Fringilla nivalis* Linnaeus, 1766, Switzerland.
Forms a superspecies with *M. adamsi* and *M. henrici*, and all have in the past sometimes been considered conspecific. Races are geographically isolated from one another, and it is suggested that, in absence of gene flow, several are well towards achieving full species rank. Seven subspecies currently recognized.
Subspecies and Distribution.
M. n. nivalis (Linnaeus, 1766) – S Europe from N Spain, Pyrenees, the Alps and Corsica E to Greece.
M. n. leucura Bonaparte, 1855 – S & E Asia Minor.
M. n. alpicola (Pallas, 1811) – Caucasus, and N Iran E to Afghanistan.
M. n. gaddi Zarudny & Loudon, 1904 – Zagros Mts, in SW Iran.
M. n. tianshanica Keve-Kleiner, 1943 – W & C Tien Shan (Kazakhstan) S to N Pamirs (N Tajikistan).
M. n. groumgrzimaili Zarudny & Loudon, 1904 – E Tien Shan, NW China (N Xinjiang) and Altai to C Mongolia.
M. n. kwenlunensis Bianchi, 1908 – mountains of S Xinjiang (Kunlun, Altun Shan and Nan Shan), in SW China.

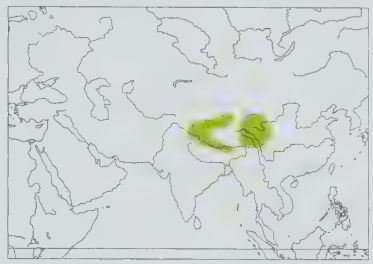


Descriptive notes. 17–17·5 cm; 31–57 g. A large, plumpish, finch-like bird with relatively long wings and tail; bill stout and pointed, longer in summer (with change in diet from harder seeds to softer insects). Male nominate race breeding has head to nape bluish-grey, black lores, black chin and throat separated from cheek by short pale stripe that joins bill; upperparts rich chocolate-brown with paler brown feather edges and tips, rump and uppertail-coverts blackish; upperwing-coverts white, alula black, primaries black with thin pale tips, secondaries white (wing showing much white, particularly in flight); tail mostly white, central feather pair and tips of all rectrices black; underparts white, breast washed light brownish-grey; iris brown; bill and legs black. Non-breeding male is similar to breeding male, but duller above, head brownish-tinged (less grey), chin and throat white with small dark feather tips, bill yellowish-horn with dark tip. Female is similar to male, but somewhat duller, with smaller, less well-defined bib; in non-breeding plumage very like non-breeding male. Juvenile is similar to female, but duller and greyer, with less white in wing and tail, bright orange-yellow bill. Races differ mainly in size and in plumage tones, to some extent also in bill length (but this requires more study, because of seasonal difference): *leucora* is larger than nominate, head and neck greyish-brown; *alpicola* is also larger and paler than nominate, grey of head somewhat bleached and brownish, back greyer brow; *gaddi* is larger and generally darker; *tianshanica* has upperparts paler, black on wing more extensive; *groumgrzimaili* also has upperparts paler, more sandy-coloured, black on wings more extensive; *kwenlunensis* is smaller and more sandy-coloured. Voice. Song, by male from high perch or in display-flight, a complex mix of varied buzzy chirps, with much repetition of individual elements such as "sitticher sitticher". Flock in flight utters harsh, nasal "pschieu" or "pchie" together with "tsee" and softer "pruuk" or "kiek"; alarm call "pititit prrt".
Habitat. Barren rocky ground with cliffs, also meadows above tree-line and up to snow-line, frequently near buildings where these present at high altitudes; 2000–5300 m.
Food and Feeding. In winter mainly seeds, including undigested seeds in droppings of horses, but also takes scraps at ski resorts; at other times of year insects, particularly grasshoppers (Orthoptera), flies (Diptera) and beetles (Coleoptera), and spiders (Araneae). Study in Switzerland in winter suggested that seeds of alpine plants are preferred over those of grasses (Gramineae). Nestlings fed almost exclusively with animal food. Food items collected mostly on ground, but some insects caught in flight. Forages in pairs and small groups; in larger flocks outside breeding season.
Breeding. Season May–Jul/Aug; two broods. Usually breeds in small loose colonies of 2–6 pairs, also solitarily; defends small territory. Pronounced circling display-flight with slowly fluttering wings. Bulky nest of dry grass and moss, lined with feathers and fine plant material, placed in crevice in rock face or hole in building, occasionally in burrow of small rodent; sometimes in artificial structure, e.g. cable-car pylon (in French Pyrenees). Clutch 4–5 eggs; incubation by female, period 12–14 days; chicks fed by both parents, nestling period 18–22 days; fledglings fed by both sexes for c. 12–15 days after leaving nest.
Movements. Mainly resident; some descent to lower altitudes in winter, particularly in E of range, but many remain near snow-line above tree-level. Vagrants recorded on Heligoland (in the German Bight), and in Canary Is, Malta, Sicily, Egypt and Iraq.
Status and Conservation. Not globally threatened. Common, but generally local. Has probably benefited from increased winter occupation of alpine resorts by humans. European population in 1980s was estimated at 15,000–23,000 birds. Breeding densities range from 20 birds/km² in Cantabrian Mts (Spain) and 9·4–11·7 pairs/km² in French Pyrenees to 4·5–11·5 birds/km² in the Alps.
Bibliography. Busching (2003), Cheng Tsohsin (1987), Clement *et al.* (1993), Cramp & Perrins (1994), Dickinson (2003), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Gebauer & Kaiser (1994), Gebauer *et al.* (2006), Grangé (2008), Haffer (1997c), Hagemeijer & Blair (1997), Kirwan *et al.* (2008), Malle (2006), Patrikeev (2004), Piechocki & Bołod (1972), Portenko & Vietinghoff-Scheel (1974a), Qu Yanhua, Ericson *et al.* (2006), Qu Yanhua, Lei Fumin *et al.* (2002), Rasmussen & Anderton (2005b), Roberts (1992), Stegmann (1932), Vaurie (1959), Wehrle (1989), Ziswiler (1967).

34. Black-winged Snowfinch
Montifringilla adamsi

French: Niverolle du Tibet **German**: Adamsschneesperling **Spanish**: Gorrión de Adams
Other common names: Adams's Snowfinch

Taxonomy. *Montifringilla Adamsi* Adams, 1859, Ladakh, India.
Forms a superspecies with *M. nivalis* and *M. henrici*, and all have in the past sometimes been considered conspecific. Two subspecies recognized.
Subspecies and Distribution.
M. a. adamsi Adams, 1859 – N Kashmir and Ladakh NE along N Tibetan Plateau to Kunlun Shan (in Xinjiang), and SE along Himalayan chain to Sikkim (N India).
M. a. xerophila Stegmann, 1932 – C China from NE Qinghai (Qilian Shan) S to E Tibetan Plateau and SC Sichuan (Litang).

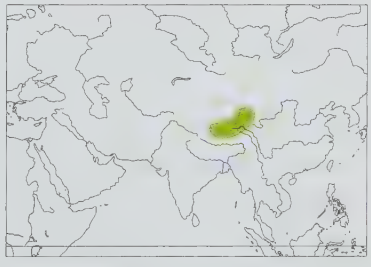


Descriptive notes. 17 cm. Nominate race has head grey-brown, faint paler supercilium and submoustachial streak, black chin and throat with small whitish feather tips; upperparts grey-brown with dark streaks, rump and uppertail-coverts blackish-brown; median upperwing-coverts dark brown with broad white fringes, greater coverts white (sometimes some brown on inner webs of some), alula dark brown, primary coverts white with dark tips, primaries blackish-brown with narrow pale edges, secondaries blackish with whitish distal half; tail white, central feather pair black, all rectrices with black tip; underparts creamy white, breast washed buff; iris brown; bill horn-coloured, becoming black in breeding season; legs black. Differs from similar *M. nivalis* mainly in having less contrasting plumage, less white in wing. Female has throat spot fainter, black of wings slightly browner. Juvenile is similar to adult, but warmer brown, with less white in wing, throat greyish, yellow bill base. Race *zerophila* is paler than nominate. Voice. Song a distinctive single note repeated rather monotonously from top of rock or during display-flight. Call a sharp, strident "pink pink". Large flocks keep up a constant soft twittering.
Habitat. Occupies rocky, high-altitude steppe country and the neighbourhood of upland villages; near edges of streams and melting snowfields. At 3500–5200 m, but usually at lower altitudes than *M. nivalis*.
Food and Feeding. Seeds of alpine plants and insects. Forages on ground, searching under rocks, commonly at edge of snowfields, and catches insects in flight. In pairs and family groups; outside breeding season in flocks, sometimes very large ones.
Breeding. Season May–Jul. Breeds in loose colonies or isolated pairs. Has well-developed parachuting display-flight, hovering and falling with wings and tail outspread. Nest a cup of grass, wool and similar material, lined with hair, feathers and fragments of wool, normally placed in rock crevice or hole under boulder, less commonly in burrow of pika (*Ochotona*). Clutch 4 eggs; incubation probably by both sexes; chicks fed by both adults. No other information.
Movements. Nomadic, forming large flocks after breeding; tendency to remain at high altitudes through the winter months.
Status and Conservation. Not globally threatened. Fairly common to common; rare and irregular in Sikkim.
Bibliography. Ali & Ripley (1974), Cheng Tsohsin (1987), Clement *et al.* (1993), Dickinson (2003), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Gebauer & Kaiser (1994), Gebauer *et al.* (2006), Li Dehao *et al.* (1978), Portenko & Vietinghoff-Scheel (1974b), Qu Yanhua, Ericson *et al.* (2006), Qu Yanhua, Lei Fumin *et al.* (2002), Rasmussen & Anderton (2005b), Roberts (1992), Schäfer (1938), Stegmann (1932), Vaurie (1959, 1972).

35. Tibetan Snowfinch
Montifringilla henrici

French: Niverolle de Henri **German**: Tibetschneesperling **Spanish**: Gorrión de Henri

Taxonomy. *Eurhinospiza Henrici* Oustalet, 1892, "plateau du Tibet" = Dichi (Diti) east of the Tengri Nor, Xizang, China.
Forms a superspecies with *M. nivalis* and *M. adamsi*, and all have in the past sometimes been considered conspecific. Often treated as a race of *M. nivalis*, and sometimes of *M. adamsi*, but overlaps with latter without interbreeding in parts of its range. Monotypic.
Distribution. E Tibetan Plateau from Qinghai Hu (NE Qinghai) S in band 100–250 km broad to Ku-la Shan, NE of Lhasa (Xizang).



Descriptive notes. 17 cm; 40 g. Male has head and nape earth-brown; mantle, back and scapulars dark brown, large white patch on wing (noticeable in flight); small black bib; underparts grey, flanks washed rusty brown; iris brown; bill horn-coloured, becoming black during breeding; legs black. Differs from very similar *M. nivalis* mainly in larger size and generally darker and duller plumage. Female is slightly duller than male, with bib smaller. Juvenile apparently undescribed. Voice. No detailed information. Generally similar to that of *M. nivalis*.
Habitat. High-altitude steppe country from above trees to snow-line; 2500–4500 m.
Food and Feeding. Seeds and plant matter; young reared on insects, both larval and adult forms of beetles (Coleoptera) and flies (Diptera), and arachnids. In small groups and larger flocks.
Breeding. Pairs take up nesting territories in Apr/May, breeding Jun–Aug. No other information.
Movements. No information.
Status and Conservation. Not globally threatened. Few data available. Reckoned to be fairly common.
Bibliography. Cheng Tsohsin (1987), Clement *et al.* (1993), Fu Tongsheng *et al.* (1998), Gebauer & Kaiser (1994), Gebauer, Eck *et al.* (2006), Gebauer, Kaiser & Eck (2003), Martens & Eck (1995), Moreau & Greenway (1962), Schäfer (1938), Stegmann (1932), Vaurie (1956, 1959).

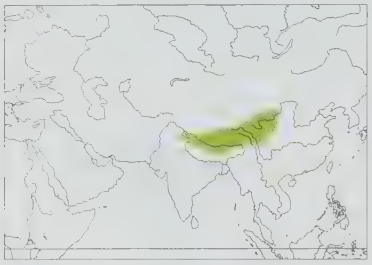
Genus *PYRGILAUDA* J. Verreaux, 1870

36. White-rumped Ground-sparrow

Pyrgilauda taczanowskii

French: Niverolle de Taczanowski **Spanish**: Gorrión de Taczanowski
German: Weißbürzel-Erdsperling
Other common names: White-rumped Snowfinch, Taczanowski's/Mandelli's Ground-sparrow/Snowfinch

Taxonomy. *Montifringilla taczanowskii* Przevalski, 1876, Tetunga and Koko Nor Steppe, west China.
Genus often subsumed into *Montifringilla*. On basis of recent studies, some authorities consider this species sufficiently differentiated in behaviour and molecular genetics from the other ground-sparrows to warrant placement in a separate genus, *Onychostruthus*; differences are, however, marginal, and it is retained in present genus pending further study. Monotypic.
Distribution. SE Ladakh and S & E Tibetan Plateau E to NE Qinghai (Qilian Mts and area around Qinghai Hu), SW Gansu and NW Sichuan, in C China, and S to N Nepal and Sikkim.



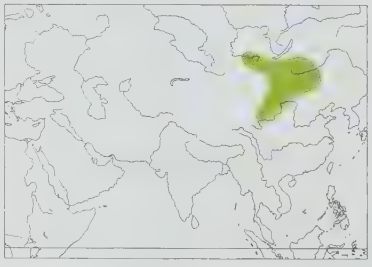
Descriptive notes. 15–17cm; 29–36 g. Large ground-sparrow with stout and rather pointed bill and long legs. Crown and nape are grey-brown, paler on forehead and supercilium, lores black; upperparts grey-brown, dark brown streaking on mantle and upper back, plain white rump; tail dark brown, outer feathers increasingly white towards tip; median upperwing-coverts blackish, tipped white, greater coverts dark brown with pale buffy edges (inner greater coverts with more white), alula and primary coverts blackish, flight-feathers blackish, broad white panel at base, primaries edged white, secondaries edged pale buff; chin and throat white, underparts ashy white, breast and flanks washed greyish-buff; iris brown; bill pale horn with dark tip; legs black. Sexes alike. Juvenile is similar to adult, but warmer brown in colour. Voice. Call a sharp and resounding "duid duid". Song based on this call, a short, loud "duid-ai-duid duid duid ai", given in display-flight similar to that of larks (Alaudidae).
Habitat. Barren alpine rocky areas and flat steppe on dry edges of bogs; associated with colonies of pika (*Ochotona*), using burrows for both roosting and breeding. Moves into neighbourhood of human habitations in winter. At 3500–5100 m.
Food and Feeding. Small seeds and insects. Forages on ground, turning over small stones and digging into soil; in non-breeding season, searches for insects in dung of domestic animals near human habitations. Runs rapidly on its long legs. Singly and in pairs; in larger flocks in non-breeding season.
Breeding. Two nests with young in Jul. Breeds in solitary pairs or in small groups. Strongly territorial; has undulating display-flight, also steep climb and diving descent. Nest a mat of roots and grasses, lined with fur and feathers, placed well inside hole of small mammal, particularly black-lipped pika (*Ochotona curzoniae*), scraping out soil with its strong feet. Clutch 3–5 eggs. No other information.
Movements. Mainly sedentary; some seasonal short-distance movements to lower altitudes in winter.
Status and Conservation. Not globally threatened. Common in much of range; scarce in S, e.g. Ladakh and Nepal.
Bibliography. Ali & Ripley (1974), Cheng Tsohsin (1987), Clement *et al.* (1993), Dickinson (2003), Eck (1996), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Gebauer & Kaiser (1994), Gebauer *et al.* (2006), Lei Fumin *et al.* (2004), Neufeldt & Vietinghoff-Scheel (1978a), Qu Yanhua & Lei Fumin (2009), Qu Yanhua, Ericson *et al.* (2006), Qu Yanhua, Lei Fumin & Yin Zuohua (2004), Qu Yanhua, Lei Fumin, Yin Zuohua & de Ritis (2002), Rasmussen & Anderton (2005b), Schäfer (1938), Vaurie (1959, 1972), Yang *et al.* (2006).

37. Small Ground-sparrow

Pyrgilauda davidiana

French: Niverolle de David **German**: Daviderdsperling **Spanish**: Gorrión de David
Other common names: (Père) David's Ground-sparrow/Snowfinch, Mongolian/Small Snowfinch

Taxonomy. *Pyrgilauda davidiana* J. Verreaux, 1870, "Mountains of Chinese Tibet" = plains of the Ourato (Suiyuan), Inner Mongolia.
Genus often subsumed into *Montifringilla*. Two subspecies recognized.
Distribution and Subspecies.
P. d. potanini Sushkin, 1925 – Russian Altai E to SE Transbaikalia and E Mongolia.
P. d. davidiana J. Verreaux, 1870 – S Mongolia and N China (S & E Inner Mongolia S to NE Qinghai).



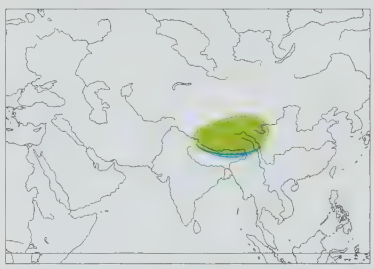
Descriptive notes. 12–15 cm; 20–25 g. One of the smaller ground-sparrows; relatively short wing and tail noticeable in flight. Nominate race has forehead, lores, chin and throat black, crown and upperparts tawny-brown, streaked darker on back, indistinct pale whitish-buff supercilium curving down behind pale fawn-brown ear-coverts; upperwing-coverts like back, greater coverts with pale buffy fringes, alula and primary coverts black, latter with pale bases, flight-feathers blackish with pale edging; central tail feathers blackish, outer feathers white or mostly grey; underparts white, breast often washed light buffish; iris brown; bill pale greyish to straw-coloured, tip black; legs dark grey to blackish. Sexes similar. Juvenile is paler than, lacks black on face. Race *potanini* is paler, more sandy-coloured and less streaked above than nominate. Voice. Rather silent; flocks give constant quiet twittering call as contact.
Habitat. Semi-desert, stony plains and rocky plateaux with short dry grass, desert edge, usually close to water on edges of marshes; 1000–3000 m, occasionally higher, to 4500 m.
Food and Feeding. Poorly studied. Small seeds of grasses and dwarf alpine plants, and insects. Spends most of the time on ground, where it moves rapidly; searches the dung of domestic animals for food items. In pairs and small groups; larger flocks outside breeding season.
Breeding. Season May–Jul/early Aug. Breeds as solitary pair or in loose colony. Strongly territorial. Nest constructed from dry grass, wool and soft plant material, placed 0·5–1 m from entrance in burrow of small mammal, including suslik (*Citellus*), pika (*Ochotona*) and hamster (*Cricetus*), material almost filling the cavity; can also excavate own cavity. Clutch 5–6 eggs; incubated by female. No other information.
Movements. Mainly sedentary; some post-breeding descent to lower altitudes, even to N of breeding range. Vagrants recorded in SE Turkmenistan and N India (Sikkim).
Status and Conservation. Not globally threatened. Sparsely distributed, but locally common to abundant.
Bibliography. Ali & Ripley (1974), Busching (2003), Cheng Tsohsin (1987), Clement *et al.* (1993), Dickinson (2003), Étchécopar & Hüe (1983), Flint *et al.* (1984), Fu Tongsheng *et al.* (1998), Gebauer & Kaiser (1994), Gebauer *et al.* (2006), Ivanitskii (1997), Neufeldt & Vietinghoff-Scheel (1978b), Piechocki & Bolod (1972), Qu Yanhua, Ericson *et al.* (2006), Qu Yanhua, Lei Fumin *et al.* (2002), Stepanyan (2003), Vaurie (1959).

38. Rufous-necked Ground-sparrow

Pyrgilauda ruficollis

French: Niverolle à cou roux **German**: Rothals-Erdsperling **Spanish**: Gorrión Cuellirrufo
Other common names: Rufous-necked Snowfinch, Red-necked Ground-sparrow/Snowfinch

Taxonomy. *Montifringilla ruficollis* Blanford, 1871, Kangra Lama Pass, north Sikkim, India.
Genus often subsumed into *Montifringilla*. Two subspecies recognized.
Subspecies and Distribution.
P. r. isabellina Stegmann, 1932 – N Tibetan Plateau from E Kunlun Shan and Altun Shan E to W Qilian Mts.
P. r. ruficollis (Blanford, 1871) – S & E Tibetan Plateau E to C China (SW Qinghai and W Sichuan), S to N Himalayas (N Nepal E to Sikkim).



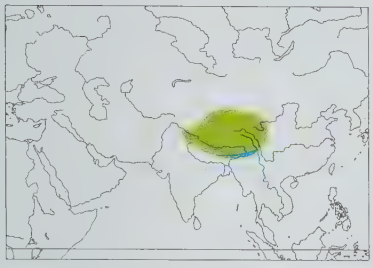
Descriptive notes. 13–15 cm; 23–28 g. Distinctive ground-sparrow with small, pointed bill. Nominate race is mainly rufous-brown, with distinctive head pattern of grey crown, white supercilium, black line through eye and black moustachial streak, white cheek bordered at rear by reddish band that extends to side of neck; upperparts streaked darker brown, lower back to uppertail-coverts plain brown; upperwing brown, median and greater coverts with broad white tips, flight-feathers blackish with paler edging, white patch at base of secondaries and inner primaries; tail dark brown on central feather pair, outer feathers mostly white with dark tips; chin and throat white, underparts creamy white, side of breast with gingery wash; iris reddish-brown; bill dark grey, becoming black in breeding season; legs black. Sexes similar, female sometimes browner on head and with less white in wing. Juvenile is plainer and browner than adult. Race *isabellina* is paler than nominate. Voice. Call a soft "duuid" or "doooid"; calls used in song in display-flight accompanied by buzzing noises. Chattering alarm, likened to call of Common Magpie (*Pica pica*).
Habitat. High barren stony steppes and grassy plateaux, particularly on edges of small watercourses, rubbish tips near human habitations; associated with pika (*Ochotona*) and vole (*Microtus*) colonies, though less so than congeners. At 3500–5000 m.
Food and Feeding. Seeds and insects. Forages on ground, and searches dung of domestic animals. Runs extensively; can dig with legs and bill. In pairs and small flocks; larger flocks outside breeding season.
Breeding. Season May–Jun. Breeding in solitary pairs or small groups. Strongly territorial; in display-flight rises silently, sings in diving descent. Nest constructed with plant material, lined with hair, placed in rock hole or in burrow of small mammal, particularly Brandt's vole (*Microtus brandti*). Clutch 4–5 eggs. No other information.
Movements. Nomadic; moves to lower altitudes in winter.
Status and Conservation. Not globally threatened. Common in most of range; scarce at S limits in Nepal and N India.
Bibliography. Ali & Ripley (1974), Cheng Tsohsin (1987), Clement *et al.* (1993), Dickinson (2003), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Gebauer & Kaiser (1994), Gebauer *et al.* (2006), Lei Fumin *et al.* (2005), Moreau & Greenway (1962), Qu Yanhua, Ericson *et al.* (2006), Qu Yanhua, Lei Fumin *et al.* (2002), Rasmussen & Anderton (2005b), Schäfer (1938), Stegmann (1932), Vaurie (1959, 1972), Vietinghoff-Scheel (1980b).

39. Blanford's Ground-sparrow

Pyrgilauda blanfordi

French: Niverolle de Blanford **German**: Blanforderdsperling **Spanish**: Gorrión de Blanford
Other common names: Blanford's Finch/Snowfinch, Plain-backed Ground-sparrow/Snowfinch

Taxonomy. *Montifringilla Blanfordi* Hume, 1876, borders of Tibet to the north of Sikkim, Xizang, China.
Genus often subsumed into *Montifringilla*. Sometimes treated as conspecific with *P. theresae*, but significant plumage differences. Three subspecies recognized.
Subspecies and Distribution.
P. b. ventorum Stegmann, 1932 – NW China from SE Xinjiang (Altun Shan) E to NW Qinghai.
P. b. barbata Przevalski, 1887 – NC China (E Qinghai).
P. b. blanfordi (Hume, 1876) – Tibetan Plateau from S Qinghai S to E Ladakh, N Nepal and Sikkim.
Descriptive notes. 15 cm. Colourful finch-like bird with fairly small, conical bill, resembling *P. ruficollis*. Nominate race has characteristic face pattern of white forehead bisected by black, black line through eye and creamy-white cheek, reddish-chestnut nape, upper back and side of throat, and small black bib; upperparts sandy brown, streaked darker brown; upperwing-coverts like back, greater coverts with paler edges and tips, alula and primary coverts darker, flight-feathers dark brown with whitish edging, pale patch at base of secondaries and inner primaries (prominent in flight); central rectrices brown to grey-brown, remainder white with darker smudges and black (or black and white) tips; underparts creamy white, breast washed warm buffish; iris brown; bill slaty black; legs black. Sexes similar, female sometimes with head markings greyer, less black, than male's. Juvenile has head patter like washed-out version of adult, chin dark grey, throat and under-



parts greyish-buff, bill yellowish. Race *barbata* is greyer, less rufous, above than nominate; *ventorum* is generally much paler. Voice. Rapid twittering song, given both from ground and in display-flight.

Habitat. Dry sandy plains and stony areas on edges of sparse, grassy steppes and in neighbourhood of habitations; associates with pikas (*Ochotona*) and voles (*Microtus*). At 4000–5500 m.

Food and Feeding. Seeds and insects. Forages on ground; runs extensively, digs with legs and bill. Forages near houses in winter. In pairs and small flocks; larger gatherings outside breeding.

Breeding. Few data. Nests recorded May to early Jun. Breeds in loose colony. Strongly territorial; has hovering display-flight. Nest in burrow of small mammal, principally pika or Brandt's vole (*Microtus brandti*). No other information.

Movements. Mainly sedentary; some movement to lower altitudes and S to N India in winter.

Status and Conservation. Not globally threatened. Common to locally common.

Bibliography. Ali & Ripley (1974), Cheng Tsohsin (1987), Clement *et al.* (1993), Dickinson (2003), Étchécopar & Hüe (1983), Fu Tongsheng *et al.* (1998), Gebauer & Kaiser (1994), Gebauer *et al.* (2006), Qu Yanhua, Ericson *et al.* (2006), Qu Yanhua, Lei Fumin *et al.* (2002), Rasmussen & Anderton (2005b), Roberts (1992), Schäfer (1938), Stegmann (1932), Vaurie (1959, 1972), Vietinghoff-Scheel (1981).

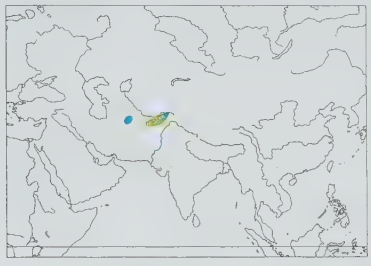
40. Afghan Ground-sparrow

Pyrgilauda theresae

French: Niverolle d'Afghanistan **German**: Afghanenerdsperling **Spanish**: Gorrión Afgano **Other common names**: Afghan Snowfinch, Theresa's Ground-sparrow/Snowfinch, Meinertzhagen's Snowfinch

Taxonomy. *Montifringilla theresae* R. Meinertzhagen, 1937, Shibar Pass, northern Afghanistan. Genus often subsumed into *Montifringilla*. Sometimes treated as conspecific with *P. blanfordi*, but significant plumage differences. Monotypic.

Distribution. N Afghanistan (N Hindu Kush Mts) and extreme S Tajikistan; some migrate to S Turkmenistan.



Descriptive notes. 13·5–15 cm; 18–35 g. Dull ground-sparrow with long, pointed bill. Male is mainly greyish-brown, with darker streaking on mantle; black from lores and narrowly around eye to chin and upper throat; median upperwing-coverts tipped whitish, greaters less prominently so, flight-feathers blackish with paler edging, bases of secondaries and of inner primaries white (conspicuous in flight); central tail feathers blackish, remainder white with blackish tips; underparts light buffish or buff-brown; iris reddish-brown; bill greyish-horn to black; legs black. Differs from superficially similar *Montifringilla nivalis* mainly in smaller size and slighter build, and fewer contrasts in plumage, with much less white in wing. Female is similar to male but duller, with less white in wing, and less marked black on lores and chin. Juvenile is more buffish than adult, has whitish chin and throat, yellowish bill. Voice. Little information. Calls include fast "zig zig", a sharp "tsi" alarm, and in flight a soft "kwaik".

Habitat. Open stony ground, slopes in mountains, flat steppes, in winter also farmland; 2400–3000 m.

Food and Feeding. Small seeds and insects; insects include weevils (Curculionidae) and ants (Formicidae). Forages on ground; runs extensively, digs with feet and bill. In small groups; large flocks outside breeding season.

Breeding. Season Jun. In loose colonies. Nest constructed mainly from animal fur and feathers, placed in hole of small rodent, mainly suslik (*Citellus*), 1 m or more from entrance, sometimes in tunnel among rocks. Clutch 5 eggs; young fed by both adults. No other information.

Movements. Resident; some descend in winter to lower altitudes, both to S and to N, reaching SE Turkmenistan.

Status and Conservation. Not globally threatened. Restricted-range species: present in Afghanistan Mountains Secondary Area. Common, but local.

Bibliography. Aichhorn (1970), Clement *et al.* (1993), Dementiev (1963), Dementiev *et al.* (1954, 1970), Dickinson (2003), Hüe & Étchécopar (1970), Rasmussen & Anderton (2005b), Tolstoj & Geipel (1990), Vaurie (1959), Vietinghoff-Scheel (1980a), Wood *et al.* (1978).

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Bangs (1928). *Proc. New England Zool. Club* **10**: 107 [*Vanga curvirostris cetera*].
Bangs (1931). *Proc. New England Zool. Club* **12**: 70 [*Chlorophoneus nigrifrons sandgroundi*].
Bangs & Penard, T.E. (1919). *Bull. Mus. Comp. Zool. Harvard* **63(2)**: 40 [*Cyanocorax sanblasianus nelsoni*].
Bangs & Penard, T.E. (1922). *Proc. New England Zool. Club* **8**: 25 [*Dicrurus forficatus potior*].
Bangs & Peters, J.L. (1926). *Bull. Mus. Comp. Zool. Harvard* **67**: 431 [*Cracticus tibicen papuanus*].
Bannerman (1926). *Bull. Brit. Orn. Club* **46(8/8)**: 126 [*Notopholia corruscus vaughani*].
Bannerman (1938). *Bull. Brit. Orn. Club* **59(1)**: 6 [*Dryoscopus angolensis boydi*].
Bannerman (1939). *Ibis* **Ser. 14, no. 3**: 748, plate 16 [*Laniarius brauni*].
Bates (1926). *Bull. Brit. Orn. Club* **46(7)**: 105 [*Grafisia*].
Bates (1932). *Bull. Brit. Orn. Club* **53(1)**: 7 [*Onychognathus neumanni modicus*].
Bates (1936). *Bull. Brit. Orn. Club* **57(1)**: 19 [*Pica asirensis*].
Beavan (1867). *Ibis* **Ser. 2, no. 3**: 323 [*Dicrurus andamanensis*], 331 [*Gracula religiosa andamanensis*].
Bechstein (1794). *Lathams Allgem. Uebers. Vög.* **2(1)**: 362 [*Dicrurus adsimilis*].
Benson (1945). *Ostrich* **16**: 134 [*Chlorophoneus olivaceus makawa*].
Benson (1956). *Bull. Brit. Orn. Club* **76(3)**: 40 [*Passer diffusus luangwae*].
Bernstein (1864). *J. Orn.* **12**: 407 [*Corvus fuscicapillus megarhynchus*], 410 [*Lycocorax pyrrhopterus obiensis*].
Bianchi (1908). *Ann. Mus. Zool. Acad. Imp. Sci. St. Pétersb.* **12** (1907): 573 [*Montifringilla nivalis kwenlunensis*].
Birckhead (1938). *Bull. Brit. Orn. Club* **58(5)**: 72 [*Urocissa erythroryncha alticola*].
Blanford (1871). *Proc. Asiatic Soc. Bengal* **7**: 277 [*Pyrgilauda ruficollis*].
Blanford (1873). *Ibis* **Ser. 3, no. 3**: 225 [*Garrulus glandarius hyrcanus*].
Blyth (1842). *J. Asiatic Soc. Bengal* **11**: 194 [*Ampeliceps*, *Ampeliceps coronatus*].
Blyth (1845). In: Hodgson, B.H., *J. Asiatic Soc. Bengal* **13(156)** (1844): 948 [*Gymnoris*].
Blyth (1845). *J. Asiatic Soc. Bengal* **13** (1844): 946 [*Passer flaveolus*, *Passer pyrrhonotus*]; **14**: 553 [*Gymnoris superciliaris*].
Blyth (1845). *Madras J. Lit. Sci.* **13(2)**: 157 [*Gracula religiosa intermedia*].
Blyth (1846). *J. Asiatic Soc. Bengal* **15**: 27 [*Urocissa erythroryncha magnirostris*, *Urocissa erythroryncha occipitalis*], 28 [*Urocissa flavirostris*], 30 [*Dendrocitta vagabunda pallida*], 34 [*Sturnia erythropygia*], 36 [*Aplonis panayensis affinis*], 285 [*Gracula ptilogenys*], 294 [*Dicrurus aeneus malayensis*], 298 [*Dicrurus caerulescens leucopygialis*].
Blyth (1850). *J. Asiatic Soc. Bengal* **19**: 225 [*Dicrurus macrocercus minor*].
Blyth (1855). *J. Asiatic Soc. Bengal* **24**: 255 [*Lamprotornis chalybaeus cyaniventris*], 301 [*Lamprotornis albicapillus*], 302 [*Passer castanopterus*].
Blyth (1863). *J. Asiatic Soc. Bengal* **32**: 77 [*Gracupica contra superciliaris*].
Bocage (1869). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa* **Ser. 1, no. 2**: 344 [*Tchagra minutus anchietae*], 345 [*Lamprotornis acuticaudus*].
Bocage (1870). In: Pless, *von der Decken's Reisen Ost-Afr.* **4** *(Vögel Ost-Afr.)*: 867 [*Cinnyricinclus leucogaster verreauxi*].
Bocage (1871). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa* **Ser. 1, no. 3**: 272 [*Neocichla gutturalis*].
Bocage (1878). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa* **Ser. 1, no. 6**: 204 [*Nilaus afer affinis*].
Bocage (1892). *J. Sci. Math. Phys. e Nat., Acad. Real Sci. Lisboa* **Ser. 2, no. 2**: 263 [*Tchagra australis souzae*].
Boddaert (1783). *Table Planches Enlum.*: 37 [*Perisoreus infaustus sibericus*], 38 [*Cissa chinensis*, *Urocissa erythroryncha*, *Cyanocorax yncas*], 39 [*Cinnyricinclus leucogaster*, *Manucodia*], 83 [*Cracticus cassicus*].
Boetticher (1940). *Anz. Orn. Ges. Bayern* **3**: 89 [*Hylopsar*].
Boie (1826). *Isis (Oken)* **19(10)**: col. 973 [*Dryoscopus*], col. 975 [*Cissa*, *Cyanocorax*].
Bonaparte (1825). *J. Acad. Nat. Sci. Philadelphia* **4(2)**: 387 [*Aphelocoma ultramarina*].
Bonaparte (1831). *Giorn. Arcadico* **29**: 42 [*Perisoreus*].
Bonaparte (1850). *Compt. Rend. Acad. Sci. Paris* **30**: 131 [*Cicinnurus respublica*].
Bonaparte (1850). *Consp. Gen. Avium* **1**: 343 [*Artamus monachus*], 344 [*Artamus cinereus perspicillatus*], 351 [*Dicrurus paradiseus brachyphorus*], 352 [*Dicrurus bracteatus carbonarius*, *Dicrurus densus*], 365 [*Prionops caniceps*], 366 [*Xenopirostris*], 368 [*Callaeas wilsoni*], 376 [*Garrulus lidthi*], 377 [*Cyanocitta stelleri diademata*], 380 [*Cyanocorax yncas guatimalensis*], 382 [*Streptocitta*, *Cyanopica*, *Cyanopica cooki*], 383 [*Pica pica bactriana*], 384 [*Lycocorax pyrrhopterus*, *Corvus enca violaceus*], 385 [*Corvus orru*, *Corvus validus*], 386 [*Corvus macrorhynchos japonensis*], 417 [*Aplonis minor*], 420 [*Acridotheres cinereus*, *Basilornis*], 422 [*Gracula religiosa venerata*], 513 [*Carpospiza brachydactyla*], 519 [*Passer euchlorus*].
Bonaparte (1852). *Tagebl. 29. Versamml. Deutsche Naturf. u. Aerzte in Wiesbaden. Beilage. Nachtrag*: 89 [*Cyanolyca viridicyana jolyaea*].
Bonaparte (1853). *Compt. Rend. Acad. Sci. Paris* **37**: 828 [*Corvus typicus*, *Garrulus glandarius cervicalis*], 829 [*Lycocorax*], 830 [*Corvus macrorhynchos philippinus*, *Cyanolyca turcosa*, *Hartlaubius*].
Bonaparte (1853). *Rev. Mag. Zool.* **Ser. 2, no. 5**: 441 [*Prionops rufiventris*].
Bonaparte (1854). *Compt. Rend. Acad. Sci. Paris* **38**: 381 [*Poeoptera*, *Poeoptera lugubris*], 535 [*Calicalicus*], 538 [*Cyanolanius*, *Leptopterus*].
Bonaparte (1855). *Compt. Rend. Acad. Sci. Paris* **41**: 657 [*Montifringilla nivalis leucura*].
Bosc (1795). *Bull. Sci. Soc. Philom. Paris* **1**: 87 [*Aphelocoma coerulescens*].
Bourns & Worcester (1894). *Minnesota Acad. Nat. Sci. Occ. Pap.* **1(1)**: 15 [*Dicrurus menagei*].
Brehm, A.E. (1857). *Allgem. Deutsche Naturhist. Zeitung (N.F.)* **3**: 446 [*Garrulus glandarius fasciatus*, *Pica pica melanotos*].
Brehm, C.L. (1822). *Beitr. Vogelkd.* **2**: 56 [*Corvus brachyrhynchos*].
Brehm, C.L. (1823). *Lehrb. Naturg. Europ. Vög.* **1**: 103 [*Nucifraga caryocatactes macrorhynchos*].
Brehm, C.L. (1828). *Isis (Oken)* **21(12)**: col. 1277 [*Montifringilla*].
Brehm, C.L. (1855). *Naumannia* **5(2)**: 277 [*Passer domesticus rufidorsalis*].
Brisson (1760). *Ornithologia Syn. Meth. Sist. Avium* **1**: 30 [*Garrulus*, *Nucifraga*, *Pica*], 32 [*Buphagus*], 36 [*Passer*].
Brodkorb (1940). *Auk* **57**: 547 [*Cyanocorax yucatanicus rivularis*].
Brooks, W.E. (1876). *Ibis* **Ser. 3, no. 6**: 500 [*Sturnus vulgaris humii*].
Browning (1993). *Bull. Brit. Orn. Club* **113(1)**: 37 [*Cyanocitta stelleri phillipsi*].
Brünnich (1764). *Orn. Borealis*: 8 [*Corvus corax varius*].
Burchell (1822). *Travels Interior South. Afr.* **1**: 387, note [*Laniarius atrococcineus*].
Burton, E. (1838). *Cat. Coll. Mamm. Birds Mus. Fort Pitt, Chatham*: 23 [*Gymnoris xanthocollis*].
du Bus de Gisignies (1839). *Bull. Acad. Roy. Sci. Bruxelles* **Ser. 1, no. 6(1)**: 295 [*Notiomystis cincta*].
du Bus de Gisignies (1847). *Bull. Acad. Roy. Sci. Bruxelles* **Ser. 1, no. 14(2)**: 103 [*Aphelocoma unicolor*, *Cyanolyca nanus*, *Cyanocorax violaceus*].
Büttikofer (1894). In: Weber, *Zool. Ergeb. Reise Niederl. Ost-Ind.* **3**: 304 [*Corvus florensis*].
Buturlin (1904). *Orn. Jahrb.* **15**: 209 [*Sturnus vulgaris tauricus*].
Buturlin (1906). *Ibis* **Ser. 8, no. 6**: 423 [*Passer montanus transcaucasicus*].
Buturlin (1913). *Dnevn. Zool. Otd. Imp. Obsht. Liubit. Estestv. (Anthr. ethn., Nov. Ser.)* **1(1)**: 58 [*Perisoreus infaustus caudatus*].
Buturlin (1913). *Mess. Orn.* **4(1)**: 40 [*Corvus macrorhynchos mandshuricus*].
Buturlin (1915). *Mess. Orn.* **6(2)**: 104 (In English 113) [*Perisoreus infaustus maritimus*].
Buturlin (1916). *Mess. Orn.* **7(1)**: 39 (In English 43) [*Perisoreus infaustus yakutensis*], 40 (In English 43) [*Perisoreus infaustus ruthenus*].
Cabanis (1851). In: Cabanis & Heine, *Mus. Hein.* **1**: 70 [*Chlorophoneus*], 86, footnote [*Cissa chinensis minor*], 87 [*Urocissa*], 111 [*Dicrurus paradiseus formosus*], 112 [*Dicrurus hottentottus brevirostris*], 205 [*Acridotheres javanicus*], 213, footnote [*Ailuroedus*], 221 [*Aphelocoma*], 223 [*Cyanolyca*].
Cabanis (1866). *J. Orn.* **14**: 310 [*Platylophus galericulatus malaccensis*].
Cabanis (1868). *J. Orn.* **16**: 412, plate 3 [*Prionops retzii graculinus*].
Cabanis (1869). In: Pless, *von der Decken's Reisen Ost-Afr.* **3(1)**: 27 [*Malaconotus blanchoti approximans*, *Tchagra senegalus orientalis*].
Cabanis (1878). *J. Orn.* **26**: 233 [*Lamprotornis hildebrandti*].
Cabanis (1883). *J. Orn.* **31**: 216 [*Cyanocorax chrysops tucumanus*].
Cabanis (1888). *J. Orn.* **36**: 119 [*Paradisaea guilielmi*, *Paradisaea raggiana augustaevictoriae*].
Cabot, S. (1843). *Proc. Boston Soc. Nat. Hist.* **1**: 155 [*Psilorhinus morio vociferus*].
Campbell, A.J. (1895). *Proc. Royal Soc. Victoria (New Ser)* **7**: 206 [*Cracticus tibicen dorsalis*].
Campbell, A.J. (1912). *Emu* **12(1)**: 19 [*Ptilonorhynchus violaceus minor*].
Carriker (1933). *Proc. Acad. Nat. Sci. Philadelphia* **85**: 30 [*Cyanocorax yncas longirostris*].
Cassin (1848). *Proc. Acad. Nat. Sci. Philadelphia* **4**: 26 [*Aphelocoma unicolor concolor*].
Cassin (1851). *Proc. Acad. Nat. Sci. Philadelphia* **5** (1852): 245 [*Telophorus viridis quadricolor*], 246 [*Laniarius sublacteus*].
Chapin (1921). *Amer. Mus. Novit.* **17**: 4 [*Buphagus africanus langi*].
Chapin (1929). *Amer. Mus. Novit.* **367**: 1 [*Sericulus bakeri*].
Chasen & Kloss (1926). *Ibis* **Ser. 12, no. 2**: 294 [*Dicrurus leucophaeus siberu*].
Chasen & Kloss (1929). *J. Orn.* **77** (Suppl. 2): 120 [*Dicrurus paradiseus banguey*].
Clancey (1954). *Durban Mus. Novit.* **4(9)**: 116 [*Passer diffusus stygiceps*].
Clancey (1957). *Bull. Brit. Orn. Club* **77(6)**: 101 [*Malaconotus blanchoti extremus*].
Clancey (1958). *Bull. Brit. Orn. Club* **78(3)**: 59 [*Passer melanurus vicinus*], **78(4)**: 75 [*Nilaus afer solivagus*].
Clancey (1959). *Durban Mus. Novit* **5(16)**: 214 [*Tchagra minutus remotus*].
Clancey (1960). *Bull. Brit. Orn. Club* **80(7)**: 123 [*Telophorus zeylonus thermophilus*].
Clancey (1960). *Durban Mus. Novit.* **6(2)**: 40 [*Telophorus viridis quartus*].
Clancey (1964). *Durban Mus. Novit.* **7(5)**: 136 [*Gymnoris superciliaris rufitergum*], 138 [*Passer motitensis subsolanus*].
Clancey (1967). *Durban Mus. Novit.* **8(10)**: 111 [*Chlorophoneus olivaceus vitorum*].
Clancey (1969). *Durban Mus. Novit.* **8(15)**: 266 [*Chlorophoneus olivaceus interfluvius*].
Clancey (1971). *Durban Mus. Novit.* **9(9)**: 123 [*Nilaus afer miombensis*].
Clancey (1973). *Durban Mus. Novit.* **9(18)**: 279 [*Lamprotornis mevesii violacior*].
Clancey (1975). *Durban Mus. Novit.* **11(1)**: 16 [*Dicrurus ludwigii tephrogaster*].
Clancey (1976). *Durban Mus. Novit.* **11(4)**: 90 [*Dicrurus adsimilis apivorus*], 97 [*Dicrurus ludwigii saturnus*].
Clancey (1980). *Durban Mus. Novit.* **12(9)**: 118 [*Lamprotornis acuticaudus ecki*].
Clarke, S.R. (1913). *Bull. Brit. Orn. Club* **31(4)**: 32 [*Telophorus viridis nigricauda*].
Clarke, S.R. (1919). *Bull. Brit. Orn. Club* **40(2)**: 50 [*Tchagra senegalus warsangliensis*].
Couch (1854). *Proc. Acad. Nat. Sci. Philadelphia* **7**: 66 [*Corvus cryptoleucus*].
Coues (1891). *Auk* **8**:115 [*Scenopoeetes*].
Coues (1899). *Auk* **16**: 84 [*Corvus brachyrhynchos pascuus*].
Cracraft (1992). *Cladistics* **8**: 10 [*Manucodia keraudrenii aruensis*], 12 [*Manucodia keraudrenii diamondi*].

Cretzschmar (1829). *Atlas Reise nördl. Afrika Rüppell (Vögel)*, Part **4**: 43, plate 29 [*Laniarius erythrogaster*].
Cuvier (1816). *Règne Animal* **1**: 399 [*Platylophus galericulatus*], 407 [*Epimachus*].
Cuvier (1829). *Règne Animal*, 2nd edition, **1**: 377 [*Gracula indica*].
D'Albertis (1877). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 1, no. 10(1)**: 12 [*Mino anais robertsoni*].
D'Albertis & Salvadori (1879). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 1, no. 14(6)**: 96 [*Paradisaea apoda novaeguineae*]; **14(8)**: 113 [*Sericulus ardens*].
Danis (1938). *Bull. Mus. Natl. Hist. Nat. Paris* **Ser. 2, no. 10**: 46 [*Aplonis brunneicapillus*].
Daudin (1800). *Traité Élément. Compl. d'Orn.* **2**: 231 [*Corvus leucognaphalus*], 244 [*Crypsirina temia*], 271 [*Paradisaea rubra*], 278 [*Seleucidis melanoleucus*], 286 [*Acridotheres melanopterus*], 308 [*Onychognathus nabouroup*], 309 [*Lamprotornis ornatus*].
Davis, L.I. (1958). *Auk* **70**: 163 [*Corvus sinaloae*].
Davison, W.R. (1892). *Ibis* **Ser. 6, no. 4**: 102 [*Acridotheres fuscus torquatus*].
De Vis (1883). *Proc. Linn. Soc. New South Wales* **7**: 561 [*Prionodura*], 562 [*Cracticus quoyi rufescens*, *Prionodura newtoniana*].
De Vis (1890). *Ann. Rep. Brit. New Guinea* **1888/1889**, App.: 61 [*Amblyornis macgregoriae*], 62 [*Cnemophilus*, *Cnemophilus macgregorii*].
De Vis (1894). *Ann. Rep. Brit. New Guinea* **1893/1894**, App.: 105 [*Paradisaea raggiana intermedia*].
De Vis (1897). *Ibis* **Ser. 7, no. 3(3)**: 390 [*Parotia lawesii helenae*].
Deignan (1955). *Bull. Brit. Orn. Club* **75(9)**: 130 [*Dendrocitta formosae sapiens*].
Delacour (1926). *Bull. Brit. Orn. Club* **47(1)**: 19 [*Cissa hypoleuca chauleti*].
Delacour (1927). *Bull. Brit. Orn. Club* **47(9)**: 164 [*Urocissa whiteheadi xanthomelana*].
Delacour (1930). *Oiseau et RFO* **11(6)**: 338 [*Cissa hypoleuca jini*].
Delacour (1931). *Oiseau et RFO (Nouv. Sér.)* **1**: 485 [*Schetba rufa occidentalis*].
Delacour & Jabouille (1924). *Bull. Brit. Orn. Club* **45(2)**: 34 [*Cissa chinensis klossi*].
Delacour & Jabouille (1928). *Bull. Brit. Orn. Club* **48(9)**: 133 [*Cissa hypoleuca concolor*, *Dicrurus remifer lefolii*].
Delacour & Jabouille (1930). *Oiseau et RFO* **11(7)**: 393 [*Urocissa flavirostris robini*].
Delessert (1840). *Rev. Zool.* **Ser. 1, no 3**: 100 [*Pica pica bottanensis*].
Diamond (1969). *Amer. Mus. Novit.* **2362**: 31 [*Epimachus fastosus ultimus*].
Domaniewski (1915). *Compt. Rend. Soc. Sci. Varsovie* **8(7)**: 566 [*Passer montanus dybowskii*].
Dubois, A.J.C. (1874). *Bull. Acad. Roy. Sci. Bruxelles* **Ser. 2, no. 38**: 492 [*Cyanocorax yncas cyanodorsalis*].
Dubois, A.J.C. (1875). *Bull. Acad. Roy. Sci. Bruxelles* **Ser. 2, no. 40**: 797 [*Cyanocorax yucatanica*].
Dubois, A.J.C. (1885). *Fauna Ill. Vert. Belg. Ois.* **1**: 572 [*Passer montanus malaccensis*].
Dybowski (1883). *Bull. Soc. Zool. France* **8**: 362 [*Corvus corax kamtschaticus*].
Ehrenberg (1833). *Symb. Phys. Icones Descr. Avium* **1**: fol. e [p. 13] [*Tchagra senegalus habessinicus*], fol. z, footnote [p. 50] [*Pyrrhocorax graculus digitatus*].
Eisentraut (1968). *Bonn. Zool. Beitr.* **19(1/2)**: 55 [*Laniarius poensis camerunensis*].
Elliot (1871). *Proc. Zool. Soc. London* **1871(2)**: 583 [*Ptiloris magnificus alberti*].
Elliot (1872). *Ibis* **Ser. 3, no. 2**: 113 [*Amblyornis*].
Elliot (1873). *Monogr. Birds of Paradise*: 13 [*Cicinnurus magnificus chrysopterus*].
Erlanger (1899). *J. Orn.* **47**: 472 [*Passer simplex saharae*], 481, plate 13, fig. 2 [*Petronia petronia barbara*].
Erlanger (1901). *Orn. Monatsber.* **9(12)**: 182 [*Laniarius ruficeps kismayensis*].
Eversmann (1842). *Addenda Pallas Zoogr. Rosso-Asiat.* **3**: 8 [*Garrulus glandarius brandtii*].
Feilden (1872). *Zoologist (London)* **Ser. 2, no. 7**: 3257 [*Sturnus vulgaris faroensis*].
Festa (1894). *Bol. Mus. Zool. Anat. Comp. Torino* **9(174)**: 3 [*Petronia petronia puteicola*].
Finsch (1876). *J. Mus. Godeffroy* **12**: 41 [*Artamus leucorynchus pelewensis*].
Finsch (1876). *Proc. Zool. Soc. London* **1875(4)**: 644 [*Aplonis pelzelni*].
Finsch (1878). *Proc. Zool. Soc. London* **1878(3)**: 713 [*Sturnus vulgaris poltaratskyi*].
Finsch (1899). *Notes Mus. Leyden* **21**: 14 [*Gracula religiosa batuensis*].
Finsch & Meyer, A.B. (1885). *Zeitschr. ges. Orn.* **2**: 378 [*Astrapia stephaniae*], 380 [*Epimachus meyeri*], 385, plate 20 [*Paradisaea rudolphi*].
Fischer, G.A. & Reichenow (1880). *J. Orn.* **28**: 141 [*Laniarius aethiopicus mossambicus*].
Fischer, G.A. & Reichenow (1884). *J. Orn.* **32(1)**: 55 [*Passer rufocinctus*], 180 [*Prionops poliolophus*].
Fischer von Waldheim, J.G. (1811). *Mém. Soc. Imp. Nat. Moscou* **1**: 3 and plate [*Corvus monedula soemmerringii*].
Fischer von Waldheim, J.G. (1821). *Lettre Adress. Soc. Imp. Nat. Moscou Docteur C. H. Pander*: 6 [*Podoces*, *Podoces panderi*].
Foerster (1906). In: Foerster & Rothschild, *Two New Birds of Paradise*: 2 [*Astrapia rothschildi*].
Forbes, H.O. (1900). *Bull. Liverpool Mus.* **2**: 116 [*Aplonis zelandica maxwellii*].
Forster, J.R. (1781). *Indian Zool.*: 40 [*Cicinnurus magnificus*, *Lophorina superba*, *Manucodia chalybatus*, *Parotia sefilata*], 41 [*Agropsar philippensis*].
Forster, J.R. (1788). *Enchiridion Hist. Nat. Inserv.*: 35 [*Callaeas*].
Friedmann (1927). *Proc. New England Zool. Club* **10**: 5 [*Malaconotus alius*].
Friedmann (1930). *J. Washington Acad. Sci.* **20**: 434 [*Neocichla gutturalis angusta*].
Friedmann (1931). *Occas. Pap. Boston Soc. Nat. Hist.* **5**: 428 [*Passer castanopterus fulgens*].
Frith, C.B. & Frith, D.W. (1997). *Bull. Brit. Orn. Club* **117(3)**: 201 [*Amblyornis macgregoriae lecroyae*].
Gentry (1885). *Proc. Acad. Nat. Sci. Philadelphia* **1885(1)**: 90 [*Cyanocorax heilprini*].
Geoffroy Saint-Hilaire, I. (1832). *Études. Zool.*: plate 3 [*Garrulus glandarius atricapillus*].
Geoffroy Saint-Hilaire, I. (1832). *Nouv. Ann. Mus. Hist. Nat.* **1**: 390 [*Philesturnus*].
Geoffroy Saint-Hilaire, I. (1836). *Bull. Soc. Sci. Nat. France* **1835**: 115 [*Falculea*, *Falculea palliata*].
Geoffroy Saint-Hilaire, I. (1838). *Rev. Zool.* **Ser. 1, no. 1**: 50 [*Oriolia*, *Oriolia bernieri*].
Giglioli & Salvadori (1870). *Atti R. Accad. Sci. Torino* **5**: 273 [*Acridotheres burmannicus leucocephalus*].
Gilliard (1961). *Amer. Mus. Novit.* **2031**: 5 [*Parotia carolae clelandiae*].
Gilliard & LeCroy (1967). *Bull. Amer. Mus. Nat. Hist.* **138(2)**: 72 [*Manucodia keraudrenii adelberti*].
Gmelin, J.F. (1788). *Syst. Nat.* **1(1)**: 306 [*Aplonis tabuensis*, *Laniarius ferrugineus*], 367 [*Corvus jamaicensis*], 370 [*Cyanocitta stelleri*], 372 [*Perisoreus canadensis pacificus*], 381 [*Aplonis striata*], 394 [*Sturnia sinensis*], 401 [*Astrapia nigra*].
Gmelin, J.F. (1789). *Syst. Nat.* **1(2)**: 805 [*Philesturnus carunculatus*, *Poliopsar sericeus*], 816 [*Sturnia malabarica*, *Sturnia pagodarum*], 824[*Laniarius aethiopicus*], 835 [*Lamprotornis bicolor*].
Gmelin, S.G. (1774). *Reise Russ.* **3**: 365 [*Pyrrhocorax pyrrhocorax docilis*].
Godwin-Austen & Walden (1875). *Ibis* **Ser. 3, no. 5(2)**: 251 [*Acridotheres albocinetus*].
Goodman, Hawkins & Domergue (1997). *Bull. Brit. Orn. Club* **117(1)**: 5 [*Calicalicus rufocarpalis*].
Gould (1833). *Proc. Zool. Soc. London* **1833(1)**, no. 5: 57 [*Dendrocitta*, *Dendrocitta leucogastra*].
Gould (1836). *Proc. Zool. Soc. London* **1835(3)**, no. 36: 185 [*Passer rutilans cinnamomeus*]; **1836(4)**, no. 37: 5 [*Dicrurus paradiseus grandis*, *Dicrurus paradiseus rangoonensis*]; **1836(4)**, no. 38: 18 [*Corvus pectoralis*]; **1836(4)**, no. 43: 73 [*Aplonis*].
Gould (1837). *Birds Austr. and Adj. Islands*, Part **1**, plate 3 and text [*Chlamydera*].
Gould (1837). *Synop. Birds Australia*, Part **1**: plate 1, fig. 2 and text [*Artamus superciliosus*], plate 2 and text [*Cracticus torquatus cinereus*], plate 3, fig. 2 and text [*Cracticus nigrogularis*], plate 4, fig. 1 and text [*Cracticus tibicen hypoleucus*], plate 5, fig. 1 and text [*Strepera fuliginosa*], plate 6 and text [*Chlamydera maculata*], plate 9 and text [*Struthidea*, *Struthidea cinerea*].
Gould (1838). *Proc. Zool. Soc. London* **1837(5)**, no. 55: 77 [*Passer iagoensis*].
Gould (1841). *Proc. Zool. Soc. London* **1840(8)**, no. 93: 120 [*Cracticus torquatus argenteus*]; **1840(8)**, no. 94: 149 [*Artamus personatus*].
Gould (1842). *Birds Austr.*, Part **6** (later bound in vol. **2**): plate 33 and text [*Artamus leucorynchus leucopygialis*].
Gould (1843). *Proc. Zool. Soc. London* **1842(10)**, no. 117: 132 [*Dicrurus bracteatus*].
Gould (1845). *Proc. Zool. Soc. London* **1845(13)**, no. 143: 1 [*Corvus frugilegus pastinator*], 2 [*Pica pica serica*].
Gould (1846). *Proc. Zool. Soc. London* **1846(14)**, no. 156: 19 [*Strepera versicolor arguta*], 20 [*Strepera versicolor melanoptera*, *Strepera versicolor plumbea*].
Gould (1848). *Birds Austr.*, Introduction (later bound in vol. **1**): 35 [*Cracticus torquatus leucopterus*]; Part **34** (later bound in vol. **2**): plate 50 and text [*Cracticus nigrogularis picatus*].
Gould (1849). *Proc. Zool. Soc. London* **1849(17)**, no. 191: 23 [*Nucifraga multipunctata*].
Gould (1850). In: Jardine, *Contr. Orn.* **1850** (Sect. D): 100 [*Chlamydera cerviniventris*].
Gould (1850). *Proc. Zool. Soc. London* **1849(17)**, no. 196: 111, plate 12 [*Ptiloris victoriae*].
Gould (1861). *Birds Asia*, Part **13** (later bound in vol. **5**): plate 51 and text [*Urocissa flavirostris cucullata*].
Gould (1862). *Birds Asia*, Part **14** (later bound in vol. **5**): plate 55 and text [*Pica pica leucoptera*].
Gould (1862). *Proc. Zool. Soc. London* **1862(1)**: 125 [*Pyrrhocorax pyrrhocorax himalayanus*]; **1862(2)**: 162 [*Chlamydera guttata*].
Gould (1863). *Proc. Zool. Soc. London* **1862(3)**: 282 [*Garrulus glandarius taivanus*, *Urocissa caerulea*].
Gould (1865). *Proc. Zool. Soc. London* **1865(1)**: 198 [*Artamus cinereus melanops*].
Gould (1868). *Proc. Zool. Soc. London* **1868(1)**: 219 [*Sturnus vulgaris purpurascens*].
Gould (1872). *Birds Asia*, Part **24** (later bound in vol. **5**): plate 15 and text [*Passer ammodendri*].
Gould (1879). *Ann. Mag. Nat. Hist.* **Ser. 5, no. 4**: 74 [*Chlamydera nuchalis orientalis*].
Grant, C.H.B. & Mackworth-Praed (1942). *Bull. Brit. Orn. Club* **63(1)**: 7 [*Cinnyricinclus leucogaster arabicus*].
Gray, G.R. (1837). *Mag. Nat. Hist. London* **Ser. 2, no. 1**: 489 [*Dryoscopus cubla affinis*].
Gray, G.R. (1841). *List Gen. Birds*, 2nd edition: 50 [*Calocitta*].
Gray, G.R. (1845). *Gen. Birds*, Part **16** (later bound in vol. **1**): plate 72 [*Chlorophoneus multicolor*].
Gray, G.R. (1846). *Gen. Birds*, Part **25** (later bound in vol. **2**): plate 74 [*Cyanolyca armillata*].
Gray, G.R. (1858). *Proc. Zool. Soc. London* **1858(26)**, no. 358: 179 [*Dicrurus densus megalornis*], 181 [*Ailuroedus melanotis*, *Aplonis metallica nitida*].
Gray, G.R. (1859). *Literary Gazette (New Ser.)* **39**: 406 [*Semioptera*, *Semioptera wallacii*].
Gray, G.R. (1859). *Proc. Zool. Soc. London* **1859(2)**: 157 [*Corvus fuscicapillus*], 158 [*Manucodia keraudrenii gouldii*], 164 [*Aplonis striata atronitens*].
Gray, G.R. (1861). *Proc. Zool. Soc. London* **1860(3)**: 354 [*Dicrurus bracteatus amboinensis*, *Dicrurus bracteatus atrocaeruleus*]; **1861(2)**: 184 [*Basilornis celebensis*].
Gray, G.R. (1862). *Proc. Zool. Soc. London* **1861(3)**: 431 [*Aplonis cantoroides*, *Aplonis mysolensis*].
Gray, G.R. (1864). *Proc. Zool. Soc. London* **1864(1)**: 45 [*Prionops retzii tricolor*].
Gray, J.E. (1831). *Zool. Misc.* **1**: 7 [*Dryoscopus sabini*].
Grinnell (1900). *Condor* **2**: 127 [*Cyanocitta stelleri carbonacea*].
Grinnell (1901). *Auk* **18**: 188 [*Aphelocoma californica immanis*].
Griscom (1934). *Bull. Mus. Comp. Zool. Harvard* **75**: 392 [*Aphelocoma californica remota*].
Gundlach (1852). *J. Boston Soc. Nat. Hist.* **6**: 315 [*Corvus palmarum minutus*].
Gyldenstolpe (1920). *Bull. Brit. Orn. Club* **41(2)**: 32 [*Dendrocitta vagabunda sakeratensis*].
Harrisson & Marshall, A.J. (1937). *Bull. Brit. Orn. Club* **57(9)**: 148 [*Aplonis santovestris*].
Hartert, E.J.O. (1896). *Novit. Zool.* **3(4)**: 547 [*Acridotheres melanopterus tertius*].
Hartert, E.J.O. (1897). *Novit. Zool.* **4(1)**: 134 [*Nucifraga caryocatactes japonica*].
Hartert, E.J.O. (1901). *Novit. Zool.* **8**: 170 [*Dicrurus densus kuehni*], 324 [*Petronia petronia intermedia*].
Hartert, E.J.O. (1902). *Novit. Zool.* **9**: 441 [*Dicrurus hottentottus suluensis*], 579 [*Dicrurus paradiseus johni*].
Hartert, E.J.O. (1903). *Bull. Brit. Orn. Club* **14(1)**: 11 [*Basilornis mirandus*].
Hartert, E.J.O. (1903). *Vögel Pal. Fauna* **1(1)**: 24 [*Cyanopica cyanus swinhoei*], 27 [*Nucifraga caryocatactes rothschildi*], 30 [*Garrulus glandarius rufitergum*], 33 [*Garrulus glandarius whitakeri*], 43 [*Sturnus vulgaris granti*].
Hartert, E.J.O. (1904). *Vögel Pal. Fauna* **1(2)**: 145 [*Gymnoris xanthocollis transfuga*], 149 [*Passer domesticus biblicus*].
Hartert, E.J.O. (1908). *Bull. Brit. Orn. Club* **23(1)**: 9 [*Chlorophoneus multicolor graueri*].
Hartert, E.J.O. (1910). *Novit. Zool.* **17**: 250 [*Acridotheres cristatellus brevipennis*], 252 [*Dendrocitta formosae insulae*].
Hartert, E.J.O. (1911). *Bull. Brit. Orn. Club* **29(3)**: 36 [*Malaconotus blanchoti interpositus*].
Hartert, E.J.O. (1912). *Bull. Brit. Orn. Club* **31(2)**: 14 [*Acridotheres cristatellus formosanus*].
Hartert, E.J.O. (1917). *Novit. Zool.* **24**: 493 [*Cyanopica cyanus interposita*].
Hartert, E.J.O. (1918). *Bull. Brit. Orn. Club* **39(2)**: 21 [*Corvus rhipidurus*].
Hartert, E.J.O. (1918). *Novit. Zool.* **25**: 329 [*Sturnus vulgaris zetlandicus*], 430 [*Garrulus glandarius interstinctus*].
Hartert, E.J.O. (1919). *Novit. Zool.* **26**: 133 [*Dicrurus bracteatus buruensis*].
Hartert, E.J.O. (1920). *Novit. Zool.* **27**: 451 [*Telophorus zeylonus phanus*].
Hartert, E.J.O. (1921). *Novit. Zool.* **28**: 134 [*Gymnoris dentata buchanani*].
Hartert, E.J.O. (1930). *Novit. Zool.* **36**: 30 [*Amblyornis macgregoriae mayri*].
Hartert, E.J.O. & Kleinschmidt, O. (1901). *Novit. Zool.* **8**: 45 [*Corvus corax canariensis*, *Corvus corax hispanus*].
Hartert, E.J.O. & Neumann (1914). *Orn. Monatsber.* **22**: 11 [*Lamprotornis chalybaeus nordmanni*].
Hartlaub (1844). *Rev. Zool.* **Ser. 1, no. 7**: 215 [*Cyanocorax melanocyaneus*].
Hartlaub (1844). *Syst. Verz. Naturhist. Samml. Ges. Mus. (Bremen)* **1**: 61 [*Malaconotus blanchoti hypopyrrhus*].
Hartlaub (1848). *Rev. Zool.* **Ser. 1, no. 11**: 108 [*Laniarius aethiopicus major*, *Laniarius leucorhynchus*].
Hartlaub (1849). *Rev. Mag. Zool.* **Ser. 2, no. 1**: 494 [*Onychognathus*], 495 [*Dicrurus modestus*, *Onychognathus fulgidus*].
Hartlaub (1857). *Syst. Orn. Westafr.*: 112 [*Dryoscopus senegalensis*, *Laniarius bicolor*], 119 [*Hylopsar cupreocauda*].
Hartlaub (1858). *Proc. Zool. Soc. London* **1858(26)**, no. 365: 291 [*Onychognathus fulgidus hartlaubii*], 292 [*Tchagra minutus*].
Hartlaub (1859). *J. Orn.* **7**: 19 [*Lamprotornis chalybaeus sycobius*], 32 [*Onychognathus blythii*].
Hartlaub (1860). *Proc. Zool. Soc. London* **1860(1)**: 111 [*Dryoscopus angolensis*].
Hartlaub (1862). *Proc. Zool. Soc. London* **1862(2)**: 152 [*Tylas*], 152, plate 18 [*Tylas eduardi*].
Hartlaub (1863). *Proc. Zool. Soc. London* **1863(2)**: 105 [*Laniarius funebris*], 106 [*Dryoscopus cubla hamatus*].
Hartlaub (1865). *Proc. Zool. Soc. London* **1865(1)**: 86 [*Laniarius bicolor guttatus*].
Hartlaub (1877). *Vögel Madagascars*: 143 [*Tylas eduardi albigularis*].
Hartlaub (1880). *J. Orn.* **28(2)**: 211 [*Passer eminibey*].
Hartlaub & Finsch (1870). In: Pless, *von der Decken's Reisen Ost-Afr.* **4** *(Vögel Ost-Afr.)*: 340 [*Tchagra senegalus remigialis*], 342 [*Laniarius bicolor sticturus*].
Hartlaub & Finsch (1871). *Proc. Zool. Soc. London* **1871(1)**: 29 [*Aplonis cinerascens*].
Heinroth (1903). *J. Orn.* **51**: 69 [*Corvus insularis*].
Hellmayr (1902). *Orn. Jahrb.* **13**: 128 [*Petronia petronia exigua*].
Hellmayr (1917). *Verh. Orn. Ges. Bayern* **13**: 107 [*Cyanolyca viridicyana cyanolaema*].
Hemprich & Ehrenberg (1828). In: Ehrenberg, *Symb. Phys. Icones Descr. Avium* **1**: plate 3 [*Telophorus cruentus*], plate 10 [*Lamprotornis chalybaeus*].
Henshaw (1886). *Auk* **3**: 452 [*Aphelocoma insularis*].
Hermann (1783). *Tab. Affin. Anim.*: 202 [*Epimachus fastosus*].
Heuglin (1862). *J. Orn.* **10(1)**: 30 [*Gymnoris pyrgita*].
Heuglin (1863). *J. Orn.* **11(1)**: 22 [*Lamprotornis purpuroptera aeneocephalus*].
Heuglin (1870). *Orn. Nordost-Afr.* **1(2) (12–15)**: 457 [*Dryoscopus gambensis malzacii*].
Heuglin (1874). *Orn. Nordost-Afr.* **2(3) (46/47)** (Nachträge & Berichtigungen): 141 [*Passer cordofanicus*].
Hilgert (1912). *Novit. Zool.* **18**: 606 [*Laniarius funebris degener*].
Hodgson (1836). *India Rev.* **1(8)**: 325 [*Dicrurus remifer tectirostris*], 326 [*Dicrurus annectans*, *Dicrurus macrocercus albirictus*]
Hodgson (1844). In: Blyth, *J. Asiatic Soc. Bengal* **13**: 367 [*Saroglossa*].

Hodgson (1849). *Ann. Mag. Nat. Hist.* **Ser. 2, no. 3**: 203 [*Corvus corax tibetanus*].
Hoogerwerf (1962). *Ardea* **50(3/4)**: 187 [*Dicrurus hottentottus faberi*].
Horsfield (1821). *Trans. Linn. Soc. London* **13**: 148 [*Aplonis panayensis strigata*], 155 [*Acridotheres melanopterus tricolour, Gracupica contra jalla*], 164 [*Corvus enca*].
Horsfield (1840). *Proc. Zool. Soc. London* **1839(7)**, no. 82: 163 [*Dendrocitta frontalis*].
Hume (1871). *Ibis* **Ser. 3, no. 1**: 408 [*Podoces hendersoni*].
Hume (1873). In: Henderson & Hume, *Lahore Yarkand*: 235 [*Corvus corax laurencei*].
Hume (1873). *Stray Feathers* **1(2–4)**: 207 [*Sturnus vulgaris minor*]; **1(5)**: 408 [*Dicrurus andamanensis dicruriformis*]; **1(6)**: 480 [*Aplonis panayensis tytleri*].
Hume (1874). *Proc. Asiatic Soc. Bengal* **5**: 106 [*Garrulus glandarius leucotis*].
Hume (1874). *Stray Feathers* **2(6)**: 480 [*Corvus splendens insolens*], 503 [*Podoces biddulphi*], 516 [*Passer ammodendri stoliczkae*].
Hume (1876). *Stray Feathers* **4(4/6)**: 487 [*Pyrgilauda blanfordi*].
Hume (1877). *Stray Feathers* **5(2)**: 117 [*Dendrocitta formosae assimilis*].
Hume (1879). *Stray Feathers* **8(2–5)**: 175 [*Sturnus vulgaris nobilior*].
Ingram (1910). *Bull. Brit. Orn. Club* **25(6)**: 86 [*Nucifraga caryocatactes owstoni*].
Irby (1874). *Ibis* **Ser. 3, no. 4**: 264 [*Corvus corax tingitanus*].
Iredale (1948). *Austr. Zool.* **11**: 162 [*Cnemophilus macgregorii sanguineus*].
Irwin (1968). *Arnoldia (Rhodesia)* **3(26)**: 2 [*Telophorus zeylonus restrictus*].
Jackson, F.J. (1893). *Bull. Brit. Orn. Club* **3(1)**: 3 [*Dryoscopus pringlii*].
Jackson, F.J. (1898). *Bull. Brit. Orn. Club* **8(3)**: 22 [*Pholia sharpii*].
Jackson, F.J. (1906). *Bull. Brit. Orn. Club* **16(8)**: 90 [*Laniarius poensis holomelas*].
Jacobi (1923). *Abh. Ber. Mus. Dresden* **16(1)**: 32 [*Passer montanus obscuratus*].
Jardine (1845). *Ann. Mag. Nat. Hist.* **Ser. 1, no. 16**: 174 [*Artamus mentalis*].
Jardine & Selby (1830). *Illustr. Orn.*, Part **7** (bound in vol. **2**): plate 103 and text [*Chlamydera nuchalis*].
Jardine & Selby (1831). *Illustr. Orn.*, Part **8** (bound in vol. **3**): plate 118 and text [*Passer domesticus indicus*].
Jerdon (1845). *Illustr. Indian Orn.*, Part **2**: plate 22 [*Sturnia malabarica blythii*].
Jerdon (1862). *Birds India* **1**: 430 [*Dicrurus leucophaeus longicaudatus*].
Jerdon (1862). *Ibis* **Ser. 1, no. 4**: 20 [*Crypsirina cucullata*], 21 [*Acridotheres burmannicus*], 22 [*Sturnia malabarica nemoricola*].
Jerdon (1864). *Birds India* **2(2)**: 874 [*Dendrocitta formosae himalayana*].
Jordans (1923). *Falco* **19** (Suppl.): 4 [*Passer domesticus balearoibericus*].
Junge (1939). *Nova Guinea Rés. Exp. Sci. Néerl. (Nouv. Sér.)* **3**: 77 [*Cnemophilus loriae inexpectatus*].
Kaleniczenko (1839). *Bull. Soc. Imp. Nat. Moscou* **12**: 325, plate 9 [*Garrulus glandarius krynicki*].
Kaup (1829). *Skizz. Entw.-Gesch. nat. Syst. Europ. Thierw.* **1**: 158 [*Petronia*].
Kaup (1854). *J. Orn.* **2(12)** (Suppl.): 55, footnote [*Aphelocoma ultramarina wollweberi*].
Kelsall (1913). *Bull. Brit. Orn. Club* **31(7)**: 85 [*Laniarius barbarus helenae*].
Keve-Kleiner [as Kleiner] (1939). *Aquila* **42–45**: 545 [*Garrulus glandarius samios*].
Keve-Kleiner [as Kleiner] (1939). *Bull. Brit. Orn. Club* **59(4)**: 71 [*Garrulus glandarius graecus*].
Keve-Kleiner (1943). *Aquila* **50**: 369 [*Garrulus glandarius ferdinandi*].
Keve-Kleiner [as Keve] (1943). *Anz. Akad. Wiss. Wien, Math-naturwiss. Kl.* **80**: 20 [*Montifringilla nivalis tianshanica*].
Kinnear & Whistler (1930). *Bull. Brit. Orn. Club* **51(1)**: 17 [*Dendrocitta formosae sarkari*].
Kittlitz (1833). *Kupfer. Naturgesch. Vögel*, Part **2**: 11, plate 15, fig. 2 [*Aplonis opaca*].
Kleinschmidt, O. (1897). *Orn. Monatsber.* **5**: 46 [*Parotia berlepschi*].
Kleinschmidt, O. (1903). *Orn. Monatsber.* **11**: 92 [*Garrulus glandarius ichnusae*].
Kleinschmidt, O. (1920). *Falco* **16**: 28 [*Garrulus glandarius albipectus*].
Kleinschmidt, O. & Weigold (1922). *Abh. Ber. Mus. Dresden* **15(3)**: 2 [*Corvus macrorhynchos tibetosinensis*].
Kleinschmidt, O. & Weigold (1922). *Falco* **18**: 2 [*Nucifraga caryocatactes interdicta*].
Kloss (1921). *J. Fed. Malay States Mus.* **10**: 208 [*Dicrurus macrocercus javanus, Dicrurus macrocercus thai*].
Kuhl (1820). *Beitr. Zool. Vergleich. Anat.* **1**: 150 [*Ptilonorhynchus*].
Kuroda, Nagamichi (1923). *Bull. Brit. Orn. Club* **43(5)**: 86 [*Garrulus glandarius orii*].
Lafresnaye (1842). *Mag. Zool.* **Ser. 2, no. 4**: plate 28 and text [*Cyanocorax sanblasianus*].
Lafresnaye (1845). *Rev. Zool.* **Ser. 1, no. 8**: 93 [*Scissirostrum*].
Lafresnaye (1850). *Rev. Mag. Zool.* **Ser. 2, no. 2**: 107, plate 1 [*Xenopirostris xenopirostris*].
Latham (1790). *Index Orn.* **1**: 151 [*Corvus albicollis*], 171 [*Dendrocitta vagabunda*], 362 [*Acridotheres ginginianus*].
Latham (1801). *Suppl. Index Orn.*: 17 [*Cracticus tibicen*], 18 [*Cracticus torquatus*], 19 [*Nilaus afer*], 20 [*Dryoscopus cubla, Nilaus afer brubru*], 25 [*Grallina cyanoleuca, Strepera versicolor*], 46 [*Artamus cyanopterus*].
Laubmann (1912). *Verh. Orn. Ges. Bayern* **11**: 164 [*Garrulus glandarius corsicanus*].
Laubmann (1913). *Orn. Monatsber.* **21**: 93 [*Corvus splendens zugmayeri*].
Laubmann (1919). *Verh. Orn. Ges. Bayern* **14**: 103 [*Corvus capensis kordofanensis*].
Lawrence (1875). *Ann. Lyc. Nat. Hist.* **11**: 88 [*Cyanolyca argentigula*], 163 [*Cyanolyca pulchra*].
Layard, E.L. (1854). *Ann. Mag. Nat. Hist.* **Ser. 2, no. 13**: 217 [*Sturnornis albofrontata*].
Layard, E.L. (1876). *Ibis* **Ser. 3, no. 6**: 147 [*Aplonis tabuensis fortunae*].
Layard, E.L. (1876). *Proc. Zool. Soc. London* **1876(3)**: 502 [*Aplonis tabuensis vitiensis*].
Layard, E.L. (1881). *Ibis* **Ser. 4, no. 5**: 542 [*Aplonis zelandica rufipennis*].
Legge (1879). *Ann. Mag. Nat. Hist.* **Ser. 5, no. 3**: 168 [*Acridotheres tristis melanosternus*].
Legge (1879). *Hist. Birds Ceylon*: 679 [*Sturnornis*].
Lesson (1827). *Bull. Sci. Nat. Géol. (Bull. Univ. Sci. Indus. Sec. 2)* **10**: 158 [*Mino*], 159 [*Mino dumontii*].
Lesson (1828). *Man. d'Orn. Descr. Espèces d'Oiseaux* **1**: 355 [*Philesturnus rufusater*].
Lesson (1830). In: Duperrey, *Voy. 'Coquille' Zool.* **1(2)**, Livr. **14**: 638 [*Mamucodia ater*].
Lesson (1831). *Ann. Sci. Nat. (Zool.)* **Ser. 1, no. 22**: 421 [*Euryceros*], 422 [*Euryceros prevostii*].
Lesson (1831). In: Bélanger, *Voy. Ind. Orient. Zool.*, Part **4**: 249 [*Malaconotus cruentus*].
Lesson (1831). *Traité d'Orn.*, Livr. **5**: 324 [*Corcorax*], 328 [*Corvus macrorhynchos levaillantii*], 329 [*Corvus moneduloides, Corvus ruficollis, Strepera*], 341 [*Temnurus*], 370 [*Artamus leucorynchus albiventer*], 373 [*Chlorophoneus sulfureopectus, Tchagra*], 374 [*Schetba*]; **6**: 401 [*Gracupica*].
Lesson (1835). *Hist. Nat. Ois. Paradis et Épimaques*: 28 (Synopsis), plate 35 [*Seleucidis*], 242 [*Paradigalla, Paradigalla carunculata*].
Lesson (1837). *Oeuvres Compl. Buffon* **9**: 53 [*Sturnia*].
Lesson (1839). *Rev. Zool.* **Ser. 1, no. 2**: 44 [*Mino anais*], 100 [*Cyanocorax yncas luxuosus*], 136 [*Pityriasis*].
Lesson (1840). *Rev. Zool.* **Ser. 1, no. 3**: 272 [*Cinnyricinclus*].
Lesson (1847). *Descr. Mamm. et Ois. Réc. Découv.*: 308 [*Creatophora*].
Lesson & Garnot (1826). *Bull. Sci. Nat. Géol. Férussac* **8**: 110 [*Manucodia keraudrenii*].
Lesson & Garnot (1827). *Bull. Sci. Nat. Géol. Férussac* **10**: 289 [*Cracticus quoyi*], 291 [*Corvus tristis*].
Lesson & Garnot (1827). In: Duperrey, *Voy. 'Coquille' Zool. Atlas* **1**, Livr. **3**: plate 19, fig. 2 [*Peltops blainvillii*].
Lewin (1808). *Birds New Holland*: 10, plate 6 [*Sericulus chrysocephalus*].
Lichtenstein, M.H.C. (1823). *Verz. Doubl. Zool. Mus. Berlin*: 20 [*Corvus capensis*], 24 [*Passer luteus, Passer simplex*], 48 [*Dryoscopus gambensis*], 53 [*Dicrurus adsimilis divaricatus*].
Linnaeus (1758). *Syst. Nat.*, 10th edition, **1**: 95 [*Dicrurus caerulescens*], 105 [*Corvus, Corvus corax, Corvus cornix, Corvus corone, Corvus frugilegus*], 106 [*Corvus monedula, Cyanocitta cristata, Garrulus glandarius, Nucifraga caryocatactes, Pica pica*], 107 [*Perisoreus infaustus*], 108 [*Gracula, Gracula religiosa, Sericulus aureus*], 110 [*Cicimurus regius, Paradisaea, Paradisaea apoda*], 118 [*Pyrrhocorax pyrrhocorax*], 167 [*Gracupica contra, Sturnus, Sturnus vulgaris*], 170 [*Pastor roseus*], 183 [*Passer domesticus, Passer montanus*].
Linnaeus (1766). *Syst. Nat.*, 12th edition, **1**: 118 [*Pyrrhocorax graculus*], 134 [*Dicrurus forficatus*], 135 [*Vanga curvirostris*], 137 [*Calicalicus madagascariensis, Laniarius barbarus, Schetba rufa, Tchagra senegalus*], 154 [*Buphagus africanus*], 155 [*Dicrurus hottentottus*], 157 [*Cyanocorax cayanus, Dicrurus balicassius, Ptilostomus afer*], 158 [*Perisoreus canadensis*], 164 [*Sarcops calvus*], 165 [*Acridotheres cristatellus*], 167 [*Acridotheres tristis*], 172 [*Dicrurus paradiseus*], 294 [*Lamprotornis nitens*], 297 [*Onychognathus morio, Telophorus zeylonus*], 306 [*Cyanolanius madagascarinus*], 321 [*Montifringilla nivalis*], 322 [*Petronia petronia*].
Linnaeus (1771). *Mantissa Plantarum*: 524 [*Artamus leucorynchus*].
Loche (1867). In: Bertrand, *Explor. Sci. l'Algérie* **1**: 132 [*Passer domesticus tingitanus*].
Lönnberg (1923). *Fauna och Flora* **18**: 264 [*Pica pica anderssoni*].
Lönnberg (1927). *Fauna och Flora* **22**: 109 [*Pica pica fennorum*].
Lorenz, T. (1887). *Beitr. Kennt. Orn. Fauna Nordseite Kaukasus*: 9, plate 5, fig. 1 [*Sturnus vulgaris caucasicus*].
Louette & Herremans (1982). *Bull. Brit. Orn. Club* **102(4)**: 133 [*Cyanolanius madagascarinus bensoni*].
Lynes (1926). *Ibis* **Ser. 12, no. 2**: 380 [*Passer motitensis henguellensis*].
Madarász (1902). *Orn. Monatsber.* **10**: 163 [*Garrulus glandarius glaszneri*].
Madarász (1904). *Ann. Hist.-Nat. Mus. Nat. Hungarici* **2**: 205 [*Laniarius aethiopicus ambiguus*].
Madarász (1904). *Orn. Monatsber.* **12**: 28 [*Corvus cornix pallescens*], 195 [*Corvus splendens protegatus*].
Malherbe (1845). *Bull. Soc. Hist. Nat. Moselle* **3**: 52 [*Pica pica mauritanica*].
Masters (1878). *Proc. Linn. Soc. New South Wales* **2(2)**: 211 [*Cracticus quoyi spaldingi*].
Mathews (1912). *Austral Avian Rec.* **1(2)**: 46 [*Cracticus torquatus colletti*]; **1(4)**: 94 [*Cracticus quoyi jardini*], 95 [*Cracticus mentalis kempi*].
Mathews (1912). *Novit. Zool.* **18(3)**: 368 [*Artamus minor derbyi*], 372 [*Cracticus tibicen terraereginae, Grallina cyanoleuca neglecta*], 437 [*Dicrurus bracteatus baileyi*], 442 [*Corvus coronoides perplexus, Corvus orru cecilae*], 443 [*Corvus mellori, Corvus tasmanicus, Strepera graculina robinsoni*], 444 [*Strepera versicolor halmaturina*], 446 [*Corcorax melanoramphos whiteae*].
Mathews (1913). *Austral Avian Rec.* **2(4)**: 78 [*Strepera graculina ashbyi*].
Mathews (1915). *Austral Avian Rec.* **2(7)**: 131 [*Artamus cyanopterus perthi*].
Mathews (1916). *Austral Avian Rec.* **3(3)**: 63 [*Strepera fuliginosa colei*].
Mathews (1920). *Ibis* **Ser. 11, no. 2**: 499 [*Chlamydera guttata carteri*].
Mathews (1923). *Austral Avian Rec.* **5**: 42 [*Struthidea cinerea dalyi*].
Mathews (1923). *Birds Austr.* **10(4)**: 255 [*Artamus cinereus normani*].
Mathews (1941). *Emu* **40(5)**: 384 [*Ailuroedus melanotis joanae*].
Mayr (1930). *Orn. Monatsber.* **38**: 147 [*Loboparadisea sericea aurora*], 179 [*Lophorina superba niedda*].
Mayr (1931). *Amer. Mus. Novit.* **486**: 19 [*Aplonis insularis*]; **504**: 21 [*Aplonis grandis macrura*], 22 [*Aplonis grandis malaitae*].
Mayr (1931). *Mitt. Zool. Mus. Berlin* **17(5)**: 647 [*Ailuroedus melanotis astigmaticus*].
Mayr (1936). *Amer. Mus. Novit.* **869**: 3 [*Astrapia splendidissima helios, Manucodia comrii trobriandi*], 4 [*Ailuroedus melanotis facialis*].
Mayr (1940). *Amer. Mus. Novit.* **1091**: 3 [*Cracticus cassicus hercules*].
Mayr (1942). *Amer. Mus. Novit.* **1166**: 1 [*Aplonis tabuensis manuae*], 2 [*Aplonis tabuensis tutuilae*], 3 [*Aplonis tabuensis nesiotes, Aplonis tabuensis tenebrosa*], 4 [*Aplonis tabuensis rotumae*], 5 [*Aplonis tabuensis pachyrampha, Aplonis tabuensis tucopiae*].
Mayr (1943). *Auk* **60**: 268 [*Artamus leucorynchus tenuis*].
Mayr & Gilliard (1950). *Amer. Mus. Novit.* **1473**: 1 [*Archboldia papuensis sanfordi*].
Mayr & Gilliard (1951). *Amer. Mus. Novit.* **1524**: 10 [*Epimachus meyeri bloodi*], 11 [*Paradisaea rudolphi margaritae*].
Mayr & Meyer de Schauensee (1939). *Proc. Acad. Nat. Sci. Philadelphia* **91**: 152 [*Ailuroedus melanotis misoliensis*].
Mayr & Rand (1935). *Amer. Mus. Novit.* **814**: 11 [*Paradisaea raggiana salvadorii*].
McGregor (1903). *Bull. Phil. Mus.* **1**: 5 [*Dicrurus hottentottus cuyensis*].
Mees (1964). *Zool. Meded. Leiden* **40**: 126 [*Ailuroedus buccoides cinnamomeus*].
Meinertzhagen, R. (1920). *Bull. Brit. Orn. Club* **41(1)** 19 [*Garrulus glandarius cretorum*].
Meinertzhagen, R. (1937). *Bull. Brit. Orn. Club* **58(1)**: 10 [*Pyrgilauda theresae*].
Meise (1929). *Orn. Monatsber.* **37**: 111 [*Aplonis feadensis heureka*].
Meise (1932). *Orn. Monatsber.* **40**: 43 [*Cyanopica cyanus stegmanni*].
Meise (1937). *J. Orn.* **85**: 452 [*Cyanopica cyanus kansuensis*].
Meise (1968). *Zool. Beitr. (N.F.)* **14(1/2)**: 51 [*Malaconotus blanchoti citrinipectus*].
Meuschen (1787). *Mus. Geversianum*: 40 [*Creatophora cinerea*].
Meyer, A.B. (1874). *Sitzungsber. K. Akad. Wiss. Wien, Math.-naturwiss. Cl. (1. Abt.)* **69(1)**: 82 [*Ailuroedus melanotis arfakianus*]; **69(3)**: 203 [*Artamus maximus*]; **69(5)**: 493 [*Chaetorhynchus, Chaetorhynchus papuensis*].
Meyer, A.B. (1884). *Abh. Naturwiss. Ges. Isis Dresden* **1884(1)**: 30 [*Artamus leucorynchus musschenbroeki*], 49 [*Aplonis metallica circumscripta*].
Meyer, A.B. (1884). *Zeitschr. ges. Orn.* **1**: 199 [*Corvus orru latirostris*].
Meyer, A.B. (1885). *Zeitschr. ges. Orn.* **2**: 375, plate 15 [*Manucodia keraudrenii purpureoviolaceus*], 383 [*Paradisaea minor finschi*], 389, plate 21 [*Cicinnurus magnificus hunsteini*].
Meyer, A.B. (1891). *Abh. Ber. Mus. Dresden* **3(4)** (1890/1891): 12 [*Ailuroedus buccoides geislerorum*].
Meyer, A.B. (1894). *Abh. Ber. Mus. Dresden* **5(2)** (1894/1895): 2 [*Basilornis galeatus*].
Meyer, A.B. (1894). *Bull. Brit. Orn. Club* **4(2)**: 6 [*Parotia carolae*]; **4(3)**: 11 [*Pteridophora, Pteridophora alberti*].
Meyer de Schauensee (1937). *Proc. Acad. Nat. Sci. Philadelphia* **89**: 337 [*Dicrurus leucophaeus bondi*].
Miller, A.H. (1933). *Trans. San Diego Soc. Nat. Hist.* **7**: 294 [*Perisoreus canadensis hicolor*].
Miller, G.S. (1896). *Auk* **13**: 34 [*Aphelocoma ultramarina gracilis*].
Miller, W. deW. & Griscom (1925). *Amer. Mus. Novit.* **184**: 7 [*Cyanocitta stelleri ridgwayi, Cyanocitta stelleri suavis*], 8 [*Cyanocorax melanocyanea chavezi*].
Milligan (1903). *Emu* **3(2)**: 96 [*Cracticus tibicen longirostris*].
Milne-Edwards, A. & Oustalet (1887). *Ann. Sci. Nat. (Zool.)* **Ser. 7, no. 2**: 225 [*Dicrurus fuscipennis*].
Moltoni (1932). *Atti Soc. Ital. Sci. Nat. Milano* **71**: 175 [*Laniarius amboimensis*].
Moltoni (1938). *Orn. Monatsber.* **46**: 80 [*Zavattariornis, Zavattariornis stresemanni*].
Momiyama (1920). *Tori* **2(9)**: 1 [*Aplonis opaca kurodai*].
Momiyama (1922). *Birds Micron.*: 6 [*Aplonis opaca anga*], 9 [*Aplonis opaca guami*].
Momiyama (1927). *Bull. Brit. Orn. Club* **48(1)**: 19 [*Garrulus glandarius hiugaensis*].
Moore, F. (1858). In: Horsfield & Moore, *Cat. Birds Mus. East India Co.* **2**: 537 [*Aeridotheres grandis*].
Moore, R.T. (1935). *Auk* **52**: 275 [*Cyanocorax dickeyi*].
Moore, R.T. (1954). *Proc. Biol. Soc. Washington* **67**: 236 [*Cyanocitta stelleri teotepecensis*].
Moreau (1941). *Bull. Brit. Orn. Club* **61(4)**: 45 [*Dryoscopus angolensis kungwensis*].
Müller, J.W. von (1854). *Descr. Ois. Afr.* **3**: plate 10 [*Carpospiza*].
Müller, S. (1836). *Tijdschr. Natuurl. Gesch. Phys.* **2**: 343, plate 5 [*Dendrocitta occipitalis*].
Nelson (1897). *Auk* **14**: 55 [*Calocitta formosa azurea*].
Nelson (1899). *Auk* **16**: 27 [*Aphelocoma ultramarina colimae, Aphelocoma ultramarina potosina*].
Nelson (1899). *Proc. Biol. Soc. Washington* **13**: 27 [*Aphelocoma californica grisea*].
Nelson (1900). *Auk* **17**: 265 [*Cyanocorax yncas speciosus*].
Nelson (1903). *Proc. Biol. Soc. Washington* **16**: 154 [*Aphelocoma unicolor guerrerensis, Cyanolyca mirabilis*].
Neumann (1899). *J. Orn.* **47**: 391 [*Malaconotus blanchoti catharoxanthus*], 412 [*Dryoscopus gambensis erythreae*].
Neumann (1899). *Orn. Monatsber.* **7**: 90 [*Prionops retzii nigricans*].
Neumann (1900). *J. Orn.* **48**: 120 [*Tchagra minutus reichenowi*].
Neumann (1903). *Orn. Monatsber.* **11**: 182 [*Telophorus cruentus hilgerti*], 183 [*Tchagra jamesi mandanus*].
Neumann (1907). *J. Orn.* **55**: 363 [*Nilaus afer massaicus*], 364 [*Nilaus afer camerunensis*].
Neumann (1908). *Bull. Brit. Orn. Club* **21(6)**: 70 [*Gymnoris pyrgita pallida, Prionops caniceps harterti*]; **23(1)**: 11 [*Leptopterus chabert schistocereus*].

Neumann (1909). *Bull. Brit. Orn. Club* **23(4)**: 53 [*Tchagra australis ansorgei*].
Neumann (1915). *J. Orn.* **63**: 121 [*Sturnus vulgaris oppenheimi*].
Neumann (1920). *J. Orn.* **68**: 80 [*Malaconotus lagdeni centralis*], 81 [*Lamprotornis splendidus bailundensis*].
Neumann (1922). *Verh. Orn. Ges. Bayern* **15**: 236 [*Astrapia stephaniae feminina*].
Newton, A. (1863). *Proc. Zool. Soc. London* **1863(1)**: 85 [*Hypositta corallirostris*].
Newton, A. (1881). *Proc. Zool. Soc. London* **1881(2)**: 438 [*Hypositta*].
Nicholson (1883). *Ibis* **Ser. 5, no. 1**: 88 [*Platylophus galericulatus lemprieri*].
Nicoll & Bonhote (1909). *Bull. Brit. Orn. Club* **23(9)**: 101 [*Passer domesticus niloticus*].
Niethammer (1955). *Bonn. Zool. Beitr.* **6**: 75 [*Passer griseus laeneni*].
Nordmann (1835). In: Erdman, *Reise um die Erde, Atlas*: 8 [*Lamprotornis chalcurus*], 9 [*Notopholia corruscus*].
North (1901). *Victorian Naturalist* **17**: 170 [*Corvus bennetti*].
Oates (1889). *Fauna Brit. India, Birds* **1**: 20 [*Corvus cornix sharpii*], 311 [*Dicrurus leucophaeus nigrescens*], 530 [*Agropsar*].
Oberholser (1899). *Proc. US Natl. Mus.* **22**: 35 [*Dicrurus modestus atactus*].
Oberholser (1906). *Proc. US Natl. Mus.* **30**: 809 [*Tchagra senegalus armenus*].
Oberholser (1912). *Smithsonian Misc. Coll.* **60(7)**: 17 [*Aplonis panayensis pachistorhina*].
Oberholser (1917). *Bull. US Natl. Mus.* **98**: 57 [*Aplonis panayensis heterochlora*], 59 [*Dicrurus paradiseus microlophus*].
Oberholser (1917). *Proc. US Natl. Mus.* **54**: 185 [*Artamus leucorynchus amydrus*].
Oberholser (1921). *Auk* **38**: 86 [*Cyanocitta cristata bromia*].
Oberholser (1926). *J. Washington Acad. Sci.* **16**: 516 [*Aplonis panayensis alipodis*, *Aplonis panayensis eustathis*], 518 [*Dicrurus paradiseus hypoballus*].
Ogawa (1905). *Annot. Zool. Jap.* **5**: 196 [*Corvus macrorhynchos osai*].
Ogilvie-Grant (1887). *Proc. Zool. Soc. London* **1887(2)**: 332, plate 37 [*Corvus woodfordi*].
Ogilvie-Grant (1899). *Bull. Brit. Orn. Club* **10(2)**: 18 [*Urocissa whiteheadi*].
Ogilvie-Grant (1900). *Bull. Brit. Orn. Club* **10(5)**: 50 [*Tchagra senegalus percivali*].
Ogilvie-Grant (1906). *Bull. Brit. Orn. Club* **16(8)**: 100 [*Sarcops calvus melanonotus*]; **19(1)**: 9 [*Cissa chinensis robinsoni*].
Ogilvie-Grant (1911). *Bull. Brit. Orn. Club* **29(2)**: 28 [*Aplonis mystacea*], 30 [*Laniarius mufumbiri*].
Ogilvie-Grant (1915). *Ibis* **Ser. 10, no. 3** (Suppl. 2): 27 [*Lophorina superba feminina*].
Ogilvie-Grant & Forbes, H.O. (1900). *Bull. Liverpool Mus.* **2**: 3 [*Passer insularis hemileucus*].
van Oort (1908). *Notes Mus. Leyden* **30**: 70 [*Aplonis magna brevicauda*].
van Oort (1915). *Zool. Meded. Leiden* **1**: 228 [*Epimachus meyeri albicans*].
d'Orbigny & Lafresnaye (1838). *Mag. Zool.* **8** (Classe 2): 9 [*Cyanolyca viridicyanus*].
Osgood (1901). *North Amer. Fauna* **21**: 46 [*Cyanocitta stelleri carlottae*].
Oustalet (1879). *Bull. Soc. Philom. Paris* **Ser. 7, no. 3**: 85 [*Lamprotornis iris*].
Oustalet (1879). *Nouv. Arch. Mus. Hist. Nat. Paris* **Ser. 2, no. 2**: 97 [*Dicrurus ludwigii sharpei*].
Oustalet (1880). *Ann. Sci. Nat. (Zool.)* **Ser. 6, no. 9(5)**: 1 [*Drepanornis bruijnii*].
Oustalet (1890). *Naturaliste (Paris)* **Ser. 2, no. 12(90)**: 274 [*Passer gongonensis*].
Oustalet (1892). *Ann. Sci. Nat. (Zool.)* **Ser. 7, no. 12(18)** (1891): 293, plate 11 [*Montifringilla henrici*].
Pallas (1776). *Reise versch. Prov. Russ. Reichs* **3**: 694 [*Corvus dauuricus*, *Cyanopica cyanus*], 695 [*Agropsar sturninus*].
Pallas (1811). *Zoogr. Rosso-Asiat.* **2**: 20 [*Montifringilla nivalis alpicola*].
Parrot (1905). *Orn. Monatsber.* **13**: 26 [*Cyanopica cyanus japonica*].
Paul von Württemberg (1835). *Erste Reise N. Amer.*: 68 [*Corvus palmarum*].
Paykull (1807). *Kung. Svenska Vet. Handl.* **28**: 291, plate 9 [*Gracupica nigricollis*].
Paykull (1815). *Nova Acta Reg. Soc. Sci. Upsaliensis* **Ser. 1, no. 7**: 283 [*Ailuroedus crassirostris*].
Paynter (1961). *J. Bombay Nat. Hist. Soc.* **58**: 381 [*Dendrocitta vagabunda bristoli*].
Peale (1848). *US Expl. Exped.*, 1st edition, **8**: 106 [*Corvus hawaiiensis*], 109 [*Aplonis atrifusca*], 111 [*Aplonis tabuensis brevirostris*].
Pelzeln (1856). *Sitzungsber. K. Akad. Wiss. Wien, Math.-naturwiss. Cl.* **20(1)**: 164 [*Cyanocorax affinis*, *Cyanocorax chrysops diesingii*].
Peters, J.L. (1920). *Proc. New England Zool. Club* **7**: 51 [*Perisoreus canadensis albescens*].
Peters, J.L. (1929). *Proc. Biol. Soc. Washington* **42**: 123 [*Corvus imparatus*].
Peters, W.K.H. (1854). *J. Orn.* **2**: 422 [*Prionops scopifrons*].
Peters, W.K.H. (1868). *J. Orn.* **16(2)**: 132 [*Dicrurus adsimilis fugax*].
Phillips, A.R. (1966). *Bull. Brit. Orn. Club* **86(6)**: 110 [*Cyanocitta stelleri restricta*], 111 [*Cyanocorax yncas confusus*].
Phillips, E.L. (1895). *Bull. Brit. Orn. Club* **4(8)**: 36 [*Corvus edithae*].
Pinto & Camargo (1961). *Arq. Zool. São Paulo* **11(9)**: 265 [*Cyanocorax chrysops insperatus*].
Pitelka (1945). *Condor* **47**: 24 [*Aphelocoma californica nevadae*].
Pitelka (1946). *Condor* **48**: 44 [*Aphelocoma unicolor oaxacae*].
Pitelka (1951). *Condor* **53**: 97 [*Cyanolyca cucullata guatemalae*, *Cyanolyca cucullata hondurensis*].
Pitelka (1951). *J. Washington Acad. Sci.* **41**: 114 [*Cyanolyca argentigula albior*].
Pitelka (1951). *Univ. Calif. Publ. Zool.* **50**: 225 [*Aphelocoma californica caurina*], 237 [*Aphelocoma californica cana*].
Pleske (1896). *Ann. Mus. Zool. Acad. Imp. Sci. St. Pétersb.* **1**: 32 [*Passer simplex zarudnyi*].
Pratt, T.K. (1982). *Emu* **82(3)**: 121 [*Amblyornis macgregoriae amati*].
Przevalski (1876). *Mongol. i Strana Tangut.* **2**: 81, plate 11, fig. 1 [*Pyrgilauda taczanowskii*].
Przevalski (1887). *Zapiski Imp. Akad. Nauk. St. Pétersbourg* **55**: 90 [*Pyrgilauda blanfordi barbata*].
Pucheran (1859). *Rev. Mag. Zool.* **Ser. 2, no. 10** (1858): 259 [*Lamprotornis splendidus lessoni*].
Quickelberge (1967). *Ann. Cape Prov. Mus. (Nat. Hist.)* **6(4)**: 50 [*Tchagra tchagra caffrariae*].
Quoy & Gaimard (1830). In: Dumont d'Urville, *Voy. 'Astrolabe'. Zool.* **1**: 184, plate 6 [*Dicrurus megarhynchus*], 190 [*Aplonis zelandica*].
Raffles (1822). *Trans. Linn. Soc. London* **13**: 306 [*Platylophus galericulatus coronatus*].
Ramsay, E.P. (1875). *Proc. Zool. Soc. London* **1874(4)**: 601 [*Ailuroedus melanotis maculosus*].
Ramsay, E.P. (1876). *Proc. Zool. Soc. London* **1875(4)**: 591 [*Scenopoeetes dentirostris*].
Ramsay, E.P. (1882). *J. Linn. Soc. London (Zool.)* **16**: 129 [*Aplonis feadensis*].
Ramsay, E.P. (1882). *Proc. Linn. Soc. New South Wales* **7**: 300 [*Dicrurus bracteatus longirostris*].
Ramsay, E.P. (1883). *Proc. Linn. Soc. New South Wales* **8**: 25 [*Ailuroedus melanotis melanocephalus*].
Ramsay, E.P. (1885). *Proc. Linn. Soc. New South Wales* **10(2)**: 242 [*Lophorina superba minor*], 243 [*Parotia lawesii*].
Ramsay, R.G.W. (1880). *Proc. Zool. Soc. London* **1880(1)**: 15 [*Dicrurus sumatranus*].
Rand (1940). *Amer. Mus. Novit.* **1072**: 9 [*Archboldia, Archboldia papuensis*].
Rand (1957). *Fieldiana Zool.* **39**: 43 [*Prionops gabela*], 49 [*Laniarius fuelleborni usambaricus*].
Rand (1958). *Fieldiana Zool.* **39**: 89 [*Dryoscopus cubla nairobiensis*].
Rand & Rabor (1961). *Fieldiana Zool.* **39**: 577 [*Corvus enca sierramadrensis*].
Rand & Vaurie (1955). *Bull. Brit. Orn. Club* **75(3)**: 28 [*Pyrrhocorax pyrrhocorax baileyi*].
Reichenbach (1850). *Av. Syst. Nat.*, Part **6**: plate 80 [*Platysmurus*].
Reichenow (1874). *J. Orn.* **22**: 101 [*Laniarius luehderi*].
Reichenow (1879). *Orn. Centralbl.* **4**: 108 [*Lamprotornis regius*, *Speculipastor*, *Speculipastor bicolor*].
Reichenow (1882). In: Heine & Reichenow, *Nomencl. Mus. Hein. Orn.* **5**: 69 [*Dicrurus leucophaeus salangensis*].
Reichenow (1884). In: Fischer & Reichenow, *J. Orn.* **32(1)**: 54 [*Lamprotornis fischeri*].
Reichenow (1885). *J. Orn.* **33**: 110 [*Corvus kubaryi*].
Reichenow (1887). *J. Orn.* **35(1)**: 63 [*Telophorus cruentus cathemagmenus*], 64 [*Tchagra australis minor*].
Reichenow (1892). *J. Orn.* **40(1)**: 36 [*Nilaus afer nigritemporalis*]; **40(2)**: 184 [*Onychognathus walleri preussi*]; **40(4)**: 441 [*Malaconotus gladiator*].
Reichenow (1893). *Orn. Monatsber.* **1**: 31 [*Poeoptera stuhlmanni*], 60 [*Tchagra australis emini*].
Reichenow (1894). *J. Orn.* **42**: 36 [*Malaconotus monteiri perspicillatus*].
Reichenow (1894). *Orn. Monatsber.* **2**: 125 [*Chlorophoneus bocagei*].
Reichenow (1896). *Orn. Monatsber.* **4**: 95 [*Chlorophoneus nigrifrons*].
Reichenow (1897). *Orn. Monatsber.* **5**: 24 [*Chlamydera lauterbachi*].
Reichenow (1900). *Orn. Monatsber.* **8**: 39 [*Laniarius fuelleborni*], 99 [*Pholia*].
Reichenow (1902). *Orn. Monatsber.* **10**: 77 [*Passer melanurus damarensis*].
Reichenow (1903). *Vög. Afr.* **2**: 544 [*Tchagra tchagra natalensis*].
Reichenow (1904). *Vög. Afr.* **3**: 231 [*Passer griseus ugandae*, *Passer suahelicus*].
Reichenow (1904). *Wiss. Ergebn. Deutschen Tiefsee Exped.* **7**: 356 [*Dicrurus leucophaeus phaedrus*].
Reichenow (1905). *J. Orn.* **53**: 425 [*Garrulus glandarius pekingensis*].
Reichenow (1905). *Vög. Afr.* **3**: 834 [*Laniarius erlangeri*].
Reichenow (1907). *J. Orn.* **55**: 470 [*Passer montanus iubilaeus*].
Reichenow (1909). *Orn. Monatsber.* **17**: 140 [*Grafisia torquata*].
Reichenow (1915). *Orn. Monatsber.* **23**: 91 [*Dicrurus ludwigii muenzneri*], 120 [*Tchagra australis damarensis*].
Reichenow (1918). *J. Orn.* **66**: 438 [*Manucodia keraudrenii neumanni*].
Reichenow (1920). *J. Orn.* **68**: 399 [*Tchagra senegalus nothus*].
Rensch (1928). *Orn. Monatsber.* **36(1)**: 7 [*Dicrurus densus vicinus*].
Rensch (1931). *Treubia* **13**: 382 [*Dicrurus densus sumbae*].
Richmond (1896). *Proc. US Natl. Mus.* **18**: 575 [*Passer montanus dilutus*].
Richmond (1897). *Auk* **14(2)**: 160 [*Pholia femoralis*], 162 [*Prionops plumatus vinaceigularis*].
Richmond (1902). *Proc. US Natl. Mus.* **25**: 290 [*Dicrurus paradiseus otiosus*], 293 [*Sturnia erythropygia katchalensis*].
Richmond (1903). *Proc. US Natl. Mus.* **26**: 518 [*Corvus enca compilator*].
Richmond (1908). *Proc. US Natl. Mus.* **35**: 634 [*Notiomystis*].
Ridgway (1873). *Amer. J. Sci.* **Ser. 3, no. 5(25)**: 43 [*Cyanocitta stelleri frontalis*].
Ridgway (1874). *Bull. Essex Inst.* **5**(1873): 194 [*Perisoreus canadensis obscurus*], 199 [*Aphelocoma californica sumichrasti*, *Aphelocoma ultramarina arizonae*].
Ridgway (1885). *Proc. US Natl. Mus.* **8**: 23 [*Cyanolyca cucullata*].
Ridgway (1887). *Man. North Amer. Birds*: 356 [*Aphelocoma californica hypoleuca*], 357 [*Aphelocoma californica cyanotis*], 361 [*Corvus corax principalis*], 362 [*Corvus brachyrhynchos hesperis*].
Ridgway (1893). *Proc. US Natl. Mus.* **16**: 597 [*Dicrurus aldabranus*].
Ridgway (1899). *Auk* **16**: 255 [*Cyanocorax affinis zeledoni*, *Cyanolyca cucullata mitrata*], 256 [*Cyanocitta stelleri azteca*].
Ridgway (1900). *Auk* **17**: 27 [*Cyanocorax yncas galeatus*], 28 [*Cyanocorax yncas glaucescens*, *Cyanocorax yncas vividus*].
Ridgway (1902). *Auk* **19**: 70 [*Aphelocoma californica texana*].
Riley (1919). *Proc. Biol. Soc. Washington* **32**: 94 [*Dicrurus montanus*].
Riley (1920). *Proc. Biol. Soc. Washington* **33**: 56 [*Enodes erythrophris centralis*].
Ripley (1950). *Postilla Yale Peabody Mus.* **1**: 3 [*Gracupica contra sordida*], 4 [*Acridotheres fuscus fumidus*].
Rippon (1905). *Bull. Brit. Orn. Club* **15(9)**: 97 [*Garrulus glandarius haringtoni*].
Roberts (1912). *J. South Afr. Orn. Union* **8**: 46 [*Gymnoris superciliaris bororensis*].
Roberts (1922). *Ann. Transvaal Mus.* **8**: 246 [*Laniarius aethiopicus limpopoensis*, *Laniarius ferrugineus natalensis*, *Laniarius ferrugineus pondoensis*, *Laniarius ferrugineus transvaalensis*], 272 [*Notopholia*].
Roberts (1931). *Ann. Transvaal Mus.* **14**: 240 [*Laniarius ferrugineus tongensis*].
Roberts (1932). *Ann. Transvaal Mus.* **15**: 31 [*Dryoscopus cubla okavangensis*, *Tchagra australis rhodesiensis*, *Tchagra senegalus kalahari*].
Robinson & Kloss (1919). *Ibis* **Ser. 11, no. 1**: 604 [*Cissa chinensis margaritae*].
Robinson & Kloss (1919). *J. Straits Branch Roy. Asiat. Soc.* **80**: 125 [*Dicrurus leucophaeus batakensis*].
da Rosa Pinto (1963). *Mem. Inst. Invest. Científica Moçambique (Sér. A)* **5**: 47 [*Laniarius ferrugineus savensis*].
da Rosa Pinto (1968). *Bonn. Zool. Beitr.* **19(3/4)**: 284 [*Tchagra australis bocagei*].
Roselaar (1993). *Dutch Birding* **15(6)**: 259 [*Corvus rhipidurus stanleyi*].
van Rossem (1928). *Auk* **45**: 361 [*Cyanocitta stelleri lazula*], 362 [*Aphelocoma unicolor griscomi*].
van Rossem (1934). *Bull. Mus. Comp. Zool. Harvard* **77**: 397 [*Cyanocorax yncas centralis*, *Cyanocorax yncas cozumelae*, *Cyanocorax yncas maya*], 415 [*Psilorhinus morio palliatus*].
Rothschild (1895). *Bull. Brit. Orn. Club* **4(6)**: 26 [*Ailuroedus melanotis jobiensis*].
Rothschild (1895). *Novit. Zool.* **2**: 59, plate 5 [*Astrapia splendidissima*], 480 [*Amblyornis flavifrons*].
Rothschild (1896). *Bull. Brit. Orn. Club* **6(3)**: 15 [*Loboparadisea*], 16 [*Loboparadisea sericea*].
Rothschild (1896). *Novit. Zool.* **3**: 10 [*Cicinnurus regius coccineifrons*].
Rothschild (1897). *Bull. Brit. Orn. Club* **6(8)**: 46 [*Paradisaea minor jobiensis*].
Rothschild (1901). *Bull. Brit. Orn. Club* **11(5)**: 52 [*Telophorus dohertyi*].
Rothschild (1903). *Bull. Brit. Orn. Club* **14(1)**: 9 [*Cissa hypoleuca katsumatae*].
Rothschild (1904). *Bull. Brit. Orn. Club* **15(2)**: 21 [*Corvus meeki*].
Rothschild (1906). In: Foerster & Rothschild, *Two New Birds of Paradise*: 2 [*Parotia wahnesi*].
Rothschild (1907). *Bull. Brit. Orn. Club* **19(9)**: 92 [*Lophorina superba latipennis*].
Rothschild (1910). *Bull. Brit. Orn. Club* **27(1)**: 13 [*Amblyornis macgregoriae germana*]; **27(3)**: 35 [*Parotia carolae meeki*].
Rothschild (1922). *Bull. Brit. Orn. Club* **43(1)**: 11 [*Passer rutilans intensior*].
Rothschild (1931). *Novit. Zool.* **36**: 250 [*Chlamydera lauterbachi uniformis*].
Rothschild & Hartert, E.J.O. (1900). *Bull. Brit. Orn. Club* **11(2)**: 29 [*Corvus unicolor*].
Rothschild & Hartert, E.J.O. (1902). *Novit. Zool.* **9**: 381 [*Corvus corax clarionensis*].
Rothschild & Hartert, E.J.O. (1903). *Novit. Zool.* **10**: 84 [*Manucodia ater alter*], 110 [*Dicrurus bracteatus meeki*].
Rothschild & Hartert, E.J.O. (1911). *Novit. Zool.* **18**: 159 [*Paradigalla brevicauda*], 160 [*Epimachus fastosus atratus*].
Rothschild & Hartert, E.J.O. (1912). *Novit. Zool.* **18** (1911): 471 [*Corvus monedula cirtensis*].
Rothschild & Hartert, E.J.O. (1929). *Bull. Brit. Orn. Club* **49(9)**: 110 [*Manucodia ater subalter*].
Rowley, I. (1970). *CSIRO Wildlife Res.* **15**: 56 [*Corvus tasmanicus boreus*].
Rüppell (1836). *Neue Wirbelth. Fauna Abyss.* **5**, *Vög.* **2**: 19, plate 8 [*Corvus crassirostris*], 22, plate 9, figs. 1–2 [*Onychognathus albirostris*], 26, plate 10, fig. 1 [*Onychognathus tenuirostris*], 30, plate 12, fig. 2 [*Prionops plumatus cristatus*].
Rüppell (1837). *Mus. Senckenb.* **2(2)**: 188 [*Psilorhinus*].
Rüppell (1840). *Neue Wirbelth. Fauna Abyss.* **13**, *Vög.* **6**: 94, plate 33 [*Passer swainsonii*].
Rüppell (1845). *Syst. Uebers. Vög. N.-O. Afr.*: 64 [*Lamprotornis purpuroptera*], 65 [*Lamprotornis superbus*].
Sabine (1823). In: Franklin, *Narr. J. Polar Sea*: 671 [*Pica hudsonia*].
Salvadori (1876). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 1, no. 7(59)** (1875): 929 [*Grallina bruijni*]; **7(61)** (1875): 969 [*Manucodia jobiensis*]; **9(4)** (1876/1877): 60 [*Aplonis panayensis sanghirensis*].
Salvadori (1878). *Atti R. Accad. Sci. Torino* **13**: 535 [*Aplonis metallica purpureiceps*].
Salvadori (1881). *Orn. Papua. Molucche*, Part **2**: 460 [*Aplonis grandis*], 573 [*Semioptera wallacii halmaherae*].
Salvadori (1881). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 1, no. 16(13)** (1880/1881): 194 [*Aplonis metallica inornata*].
Salvadori (1887). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 2, no. 4(36)**: 553 [*Aplonis panayensis altirostris*], 554 [*Gracula robusta*].
Salvadori (1890). *Agg. Orn. Papua. Molucche*, Part **1**: 94 [*Dicrurus hottentottus guillemardi*].
Salvadori (1892). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 2, no. 12(9)**: 137 [*Aplonis panayensis enganensis*, *Gracula enganensis*].
Salvadori (1894). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 2, no. 14(10)**: 151 [*Cnemophilus loriae*]; **14(38)**: 593 [*Dicrurus sumatranus viridinitens*], 594 [*Dicrurus leucophaeus periophthalmicus*].

Salvadori & D'Albertis (1876). *Ann. Mus. Civ. Storia Nat. Genova* **Ser. 1, no. 7(52)** (1875): 824 [*Cracticus mentalis*].
Salvadori & Giglioli (1885). *Atti R. Accad. Sci. Torino* **20**: 427 [*Cissa hypoleuca*].
Salvin & Godman (1883). *Ibis* **Ser. 5, no. 1**: 131 [*Paradisaea decora*].
Sassi (1923). *Orn. Monatsber.* **31**: 109 [*Dryoscopus gambensis erwini*].
Schlegel (1863). *Ibis* **Ser. 1, no. 5(2)**: 119 [*Lycocorax pyrrhopterus morotensis*].
Schlegel (1865). *Ned. Tijdschr. Dierk.* **3(1)**: 1 [*Streptocitta albertinae*]; **3(6)**: 82 [*Xenopirostris damii*], 86 [*Dicrurus waldenii*].
Schlegel (1868). In: Pollen & van Dam, *Recherches Faune Madagascar* **2**: 174 [*Xenopirostris polleni*].
Schlegel (1871). *Ned. Tijdschr. Dierk.* **4(2)**: 18 [*Aplonis magna*]; **4(4)**: 51 [*Amblyornis inornata*], 52 [*Mino anais orientalis*].
Schlüter (1911). *Falco* **7**: 2 [*Seleucidis melanoleucus auripennis*].
Schodde & Mason (1999). *Directory Austr. Birds – Passerines*: 365 [*Artamus cinereus dealbatus*], 490 [*Dicrurus bracteatus atrabectus*], 534 [*Cracticus quoyi alecto*], 546 [*Cracticus tibicen telonocua*, *Cracticus tibicen tyrannicus*], 552 [*Strepera graculina nebulosa*], 555 [*Strepera fuliginosa parvior*].
Schodde & McKean (1973). *Emu* **73(2)**: 53 [*Amblyornis macgregoriae kombok*], 55 [*Amblyornis macgregoriae nubicola*].
Schouteden (1933). *Rev. Zool. Bot. Afr.* **24**: 211 [*Prionops alberti*].
Sclater, P.L. (1858). *Ann. Mag. Nat. Hist.* **Ser. 3, no. 2**: 465 [*Onychognathus tristramii*].
Sclater, P.L. (1869). *Proc. Zool. Soc. London* **1869(1)**: 120 [*Mino kreffti*].
Sclater, P.L. (1873). *Nature (London)* **8**: 151 [*Drepanornis albertisi*], 192 [*Drepanornis*].
Sclater, P.L. (1873). *Proc. Zool. Soc. London* **1873(2)**: 559 [*Paradisaea raggiana*].
Sclater, P.L. (1876). *Proc. Zool. Soc. London* **1876(3)**: 459, plate 42 [*Manucodia comrii*].
Sclater, P.L. (1877). *Proc. Zool. Soc. London* **1876(4)**: 694 [*Corvus cornix capellanus*]; **1877(1)**: 101 [*Dicrurus bracteatus laemostictus*], 101, plate 15 [*Artamus insignis*].
Sclater, P.L. (1883). *Proc. Zool. Soc. London* **1883(1)**: 56 [*Aplonis crassa*].
Sclater, P.L. (1884). *Proc. Zool. Soc. London* **1883(4)**: 578 [*Drepanornis albertisi cervinicauda*].
Sclater, P.L. & Hartlaub (1881). *Proc. Zool. Soc. London* **1881(1)**: 169 [*Passer insularis*], 171 [*Onychognathus frater*].
Sclater, P.L. & Salvin (1876). *Proc. Zool. Soc. London* **1876(1)**: 271 [*Cyanolyca armillata meridana*], 272 [*Cyanolyca armillata quindiuna*].
Sclater, W.L. (1924). *Bull. Brit. Orn. Club* **44(9)**: 91 [*Artamella*, *Prionops scopifrons kirki*].
Sclater, W.L. & Mackworth-Praed (1918). *Ibis* **Ser. 10, no. 6**: 633 [*Telophorus cruentus kordofanicus*].
Scopoli (1786). *Deliciae Florae Faunae Insubricae*, Part **2**: 96 [*Aplonis panayensis*].
Seebohm (1883). *Ibis* **Ser. 5, no. 1**: 7 [*Garrulus glandarius anatoliae*].
Serle (1951). *Bull. Brit. Orn. Club* **71(7)**: 41 [*Chlorophoneus kupeensis*].
Sharpe (1870). *Proc. Zool. Soc. London* **1870(1)**: 148, plate 13, fig. 1 [*Malaconotus monteiri*].
Sharpe (1876). In: Layard & Sharpe, *Birds South Africa*, 2nd edition, Part **3**: 215 [*Neocichla*].
Sharpe (1876). *Nature (London)* **14**: 339 [*Ailuroedus buccoides stonii*].
Sharpe (1877). *Cat. Birds Brit. Mus.* **3**: 58 [*Strepera graculina crissalis*], 59 [*Strepera versicolor intermedia*], 181 [*Manucodia keraudrenii jamesii*], 253 [*Dicrurus caerulescens insularis*].
Sharpe (1877). *Trans. Linn. Soc. London (Zool.)* **Ser. 2, no. 1**: 344 [*Sarcops calvus lowii*].
Sharpe (1879). *Ibis* **Ser. 4, no. 3**: 250, plate 8 [*Dendrocitta cinerascens*].
Sharpe (1879). *Proc. Zool. Soc. London* **1879(2)**: 246 [*Dicrurus hottentottus borneensis*], 247 [*Dicrurus leucophaeus stigmatops*].
Sharpe (1882). In: Layard & Sharpe, *Birds South Africa*, 2nd edition, Part **5**: 397 [*Tchagra australis ussheri*].
Sharpe (1882). *J. Linn. Soc. London (Zool.)* **16**: 442 [*Manucodia keraudreni hunsteini*], 444 [*Ptiloris magnificus intercedens*].
Sharpe (1884). *J. Linn. Soc. London (Zool.)* **17**: 408 [*Amblyornis subalaris*], 425 [*Prionops rufiventris mentalis*].
Sharpe (1884). *Proc. Zool. Soc. London* **1884(1)**: 54, plate 5 [*Malaconotus lagdeni*].
Sharpe (1888). *Cat. Birds Brit. Mus.* **12**: 322 [*Passer moabiticus yatii*].
Sharpe (1888). *Ibis* **Ser. 5, no. 6**: 383 [*Cissa thalassina jefferyi*], 438 [*Sturnus vulgaris porphyronotus*], 476 [*Poliopsar*].
Sharpe (1890). *Cat. Birds Brit. Mus.* **13**: 104 [*Gracula religiosa palawanensis*], 132 [*Aplonis tabuensis brunnescens*], 190 [*Lamprotornis shelleyi*].
Sharpe (1891). *Ibis* **Ser. 6, no. 3**: 241 [*Onychognathus salvadorii*], 242 [*Onychognathus walleri elgonensis*], 256 [*Passer shelleyi*], 445 [*Laniarius luehderi castaneiceps*].
Sharpe (1895). *Proc. Zool. Soc. London* **1895(3)**: 479 [*Laniarius ruficeps rufinuchalis*, *Nilaus afer minor*].
Sharpe (1896). *Bull. Brit. Orn. Club* **5(8)**: 44 [*Garrulus glandarius oatesi*].
Sharpe (1897). *Bull. Brit. Orn. Club* **7(2)**: 17 [*Gracupica contra floweri*].
Sharpe (1900). *Bull. Brit. Orn. Club* **11(2)**: 28 [*Dryoscopus angolensis nandensis*].
Sharpe (1901). *Bull. Brit. Orn. Club* **11(5)**: 57 [*Chlorophoneus bocagei jacksoni*].
Sharpe (1901). *Ibis* **Ser. 8, no. 1**: 39 [*Dryoscopus gambensis congicus*].
Sharpe (1908). *Ibis* **Ser. 9, no. 2**: 330 [*Chlorophoneus multicolor batesi*].
Shaw (1790). In: White, *J. Voy. New South Wales*: 251 [*Strepera graculina*].
Shaw (1809). *Gen. Zool.* **7(2)**: 292 [*Prionops plumatus*], 330 [*Chlorophoneus olivaceus*], 486 [*Paradisaea minor*].
Shelley (1880). *Ibis* **Ser. 4, no. 4**: 335 [*Onychognathus walleri*].
Shelley (1881). *Ibis* **Ser. 4, no. 5(1)**: 116 [*Lamprotornis unicolor*].
Shelley (1885). *Ibis* **Ser. 5, no. 3**: 402, plate 10 [*Laniarius ruficeps*], 403, plate 10, fig. 2 [*Tchagra jamesi*].
Shelley (1887). *Proc. Zool. Soc. London* **1887(1)**: 124, plate 13 [*Laniarius atroflavus*].
Shelley (1894). *Bull. Brit. Orn. Club* **3(8)**: 42 [*Cyanolanius madagascarinus comorensis*, *Poeoptera kenricki*].
Shelley (1894). *Ibis* **Ser. 6, no. 6**: 15, plate 2, fig. 2 [*Chlorophoneus olivaceus bertrandi*].
Shelley (1899). *Bull. Brit. Orn. Club* **8(5)**: 35 [*Chlorophoneus nigrifrons manningi*].
Shelley (1906). *Birds Afr.* **5(1)**: 59 [*Lamprotornis mevesii benguelensis*].
Sick (1939). *Orn. Monatsber.* **47**: 78 [*Urocissa flavirostris schaeferi*].
Smith, A. (1834). *South Afr. Quart. J.* **Ser. 2, no. 2**: 144 [*Dicrurus ludwigii*].
Smith, A. (1836). *Rep. Exped. Explor. Central Africa*: 44 [*Chlorophoneus sulfureopectus similis*, *Tchagra australis*], 50 [*Passer diffusus*, *Passer motitensis*], 52 [*Lamprotornis australis*].
van Someren (1921). *Bull. Brit. Orn. Club* **41(7)**: 114 [*Passer diffusus mosambicus*].
van Someren (1923). *Bull. Brit. Orn. Club* **43(4)**: 80 [*Prionops scopifrons keniensis*].
de Sparre (1835). *Mag. Zool.* **5** (Classe 2): plate 34 [*Cyanocorax mystacalis*].
Stanley (1814). In: Salt, *Voy. Abyssinia*, App. 4: 50 [*Prionops plumatus poliocephalus*], 59 [*Buphagus erythrorhynchus*].
Statius Müller (1776). *Vollst. Natursystem*, Part **7** (Suppl.): 72 [*Artamella viridis*, *Leptopterus chabert*], 85 [*Corvus albus*], 139 [*Lamprotornis pulcher*], 140 [*Hartlaubius auratus*], 143 [*Lamprotornis purpureus*], 144 [*Lamprotornis caudatus*], 153 [*Passer melanurus*].
Steere (1890). *List Birds Mammals Steere Exped.*: 23 [*Corvus enca samarensis*].
Stegmann (1932). *J. Orn.* **80**: 102 [*Montifringilla adamsi xerophila*], 103 [*Pyrgilauda ruficollis isabellina*], 104 [*Pyrgilauda blanfordi ventorum*].
Steinheimer (2009). *Zootaxa* **2149**: 21 [*Dendrocitta vagabunda behni*].
Stejneger (1879). *Nyt Mag. Naturv.* **24(3)**: 291 [*Artamella viridis annae*].
Stejneger (1884). *Proc. Biol. Soc. Washington* **2**: 97 [*Pica pica camtschatica*].
Stejneger (1885). *Proc. US Natl. Mus.* **8**: 19 [*Passer montanus saturatus*].
Stepanyan (1961). *Arch. Zool. Mus. Moscow State Univ.* **8**: 220 [*Passer ammodendri nigricans*].
Stephens (1826). *Gen. Zool.* **13(2)**: 161 [*Malaconotus blanchoti*].
Stoliczka (1874). *Stray Feathers* **2(4/5)**: 462 [*Pyrrhocorax graculus forsythi*].
Stonor (1939). *Bull. Brit. Orn. Club* **59(4)**: 57 [*Astrapia mayeri*].
Stresemann (1912). *Bull. Brit. Orn. Club* **31(1)**: 4 [*Leucopsar*, *Leucopsar rothschildi*].
Stresemann (1913). *Novit. Zool.* **20**: 291 [*Artamus leucorynchus humei*], 375 [*Aplonis panayensis gusti*], 377 [*Aplonis panayensis leptorrhyncha*].
Stresemann (1913). *Orn. Monatsber.* **21**: 9 [*Dendrocitta formosae sinica*].
Stresemann (1916). *Verh. Orn. Ges. Bayern* **12**: 281 [*Corvus macrorhynchos connectens*].
Stresemann (1921). *Anz. Orn. Ges. Bayern* **1(5)**: 35 [*Peltops montanus*].
Stresemann (1922). *Orn. Monatsber.* **30**: 35 [*Ailuroedus melanotis guttaticollis*].
Stresemann (1924). *Orn. Monatsber.* **32**: 173 [*Lamprotornis chloropterus elisabeth*].
Stresemann (1928). *J. Orn.* **76**: 344 [*Pyrrhocorax pyrrhocorax centralis*].
Stresemann (1928). *Orn. Monatsber.* **36**: 41 [*Garrulus glandarius kansuensis*].
Stresemann (1932). *Orn. Monatsber.* **40**: 55 [*Passer montanus kansuensis*], 106 [*Enodes erythrophris leptorhynchus*].
Stresemann (1934). *Orn. Monatsber.* **42**: 144 [*Cnemophilus loriae amethystinus*], 145 [*Parotia carolae chalcothorax*], 147 [*Parotia carolae chrysenia*].
Stresemann (1936). *Ibis* **Ser. 13, no. 6**: 368 [*Corvus enca celebensis*].
Strickland (1845). *Ann. Mag. Nat. Hist.* **Ser. 1, no. 15**: 417 [*Cyanocitta*].
Strickland (1849). In: Jardine, *Contr. Orn.* **1849**: 122 [*Cyanolyca punilo*].
Stuart Baker (1918). *Bull. Brit. Orn. Club* **39(2)**:18 [*Dicrurus remifer peracensis*].
Stuart Baker (1918). *Novit. Zool.* **25**: 229 [*Dicrurus macrocercus harterti*], 294 [*Dicrurus leucophaeus hopwoodi*], 302 [*Dicrurus paradiseus nicobariensis*].
Stuart Baker (1922). *Fauna Brit. India, Birds*, 2nd edition, **1**: 50 [*Dendrocitta vagabunda sclateri*], 51 [*Dendrocitta vagabunda kinneari*].
Stuart Baker (1925). *Bull. Brit. Orn. Club* **45(7)**: 92 [*Passer montanus tibetanus*].
Sundevall (1850). *Öfver. Kongl. Vet. Akad. Förhandl.* **7**: 98 [*Gymnoris superciliaris flavigula*], 127 [*Gymnoris dentata*], 130 [*Prionops plumatus concinnatus*].
Sushkin (1925). *Proc. Boston Soc. Nat. Hist.* **38**: 20 [*Pyrgilauda davidiana potanini*].
Sushkin & Ptuschenko (1914). *Orn. Monatsber.* **22**: 4 [*Garrulus glandarius iphigenia*].
Sushkin & Stegmann (1929). *J. Orn.* **77**: 393 [*Perisoreus infaustus ostjakorum*], 396 [*Perisoreus infaustus tkachenkoi*].
Sutton (1935). *Auk* **52**: 176 [*Cyanocitta cristata cyanotephra*].
Swainson (1824). *Zool. J.* **1(1)** (1825): 297 [*Malaconotus*].
Swainson (1825). *Zool. J.* **1(4)**: 476 [*Sericulus*], 479 [*Ptiloris*], 481 [*Ptiloris paradiseus*].
Swainson (1827). *Philos. Mag., N.S.* **1**: 437 [*Calocitta formosa*, *Cyanocitta stelleri coronata*].
Swainson (1827). *Zool. J.* **3(2)**: 162 [*Nilaus*].
Swainson (1832). In: Swainson & Richardson, *Fauna Bor.-Amer.* **2** (1831): 481 [*Telophorus*], 482 [*Platylophus*].
Swainson (1837). *Birds West. Afr.* **1**: 143 [*Lamprotornis splendidus chrysonotis*], 256 [*Dicrurus atripennis*].
Swainson (1837). *Classif. Birds* **2**: 266 [*Ptilostomus*].
Swainson (1838). *Anim. in Menag.*: 359 [*Lamprotornis chloropterus*].
Swarth (1918). *Univ. Calif. Publ. Zool.* **17**: 413 [*Aphelocoma californica oocleptica*].
Swinhoe (1863). *Ibis* **Ser. 1, no. 5**: 269 [*Dicrurus aeneus braunianus*], 387 [*Dendrocitta formosae*].
Swinhoe (1864). *Ibis* **Ser. 1, no. 6**: 427 [*Corvus macrorhynchos colonorum*].
Swinhoe (1870). *Ibis* **Ser. 2, no. 6(2)**: 246 [*Dicrurus leucophaeus innexus*].
Swinhoe (1871). *Proc. Zool. Soc. London* **1871(2)**: 377 [*Dicrurus macrocercus cathoecus*], 381 [*Garrulus glandarius sinensis*], 383 [*Pyrrhocorax pyrrhocorax brachypus*].
Swinhoe (1874). *Proc. Zool. Soc. London* **1873(3)**: 688 [*Urocissa erythrorycha brevivexilla*].
Sykes (1832). *Proc. Zool. Soc. London* **1832(2)**, no. 18: 95 [*Acridotheres fuscus mahrattensis*], 96 [*Corvus macrorhynchos culminatus*].
Taczanowski (1874). *J. Orn.* **22**: 323 [*Petronia petronia brevirostris*].
Takatsukasa (1931). *Tori* **7**: 110 [*Garrulus glandarius tokugawae*].
Takatsukasa & Yamashina (1931). *Dōbuts. Zasshi* **43**: 458 [*Aplonis opaca orii*], 487 [*Aplonis opaca aenea*].
Takatsukasa & Yamashina (1931). *Tori* **7**: 109 [*Aplonis opaca ponapensis*].
Temminck (1815). *Man. d'Orn. Tabl. Syst.*, 1st edition, **1**: 82 [*Pastor*].
Temminck (1820). *Man. d'Orn. Tabl. Syst.*, 2nd edition, **1**: 55 [*Lamprotornis*], 133 [*Sturnus unicolor*], 353 [*Passer hispaniolensis*].
Temminck (1823). *Planches Color.*, Livr. **30**: plate 178 [*Dicrurus remifer*]; **33**: plate 193 [*Cyanocorax cristatellus*].
Temminck (1824). *Planches Color.*, Livr. **45**: plate 265 [*Platysmurus leucopterus*], plate 266 [*Aplonis metallica*], plate 267 [*Enodes erythrophris*].
Temminck (1825). *Planches Color.*, Livr. **57**: plate 337 [*Temnurus temnurus*].
Temminck (1826). *Planches Color.*, Livr. **68**: plate 401 [*Cissa thalassina*]; Livr. **70**: plate 413 [*Corvus nasicus*].
Temminck (1828). *Planches Color.*, Livr. **75**: plate 444 [*Streptocitta albicollis torquata*].
Temminck (1829). *Planches Color.*, Livr. **57** [issued in/dated from Livr. 80]: back of text to plate 337 [*Platysmurus leucopterus aterrimus*].
Temminck (1835). *Planches Color.*, Livr. **94**: plate 556 [*Poliopsar cinereaceus*].
Temminck (1836). *Planches Color.*, Livr. **97**: plate 572 [= 570] [*Pityriasis gymnocephala*], plate 575 [*Ailuroedus buccoides*]; **99**: plate 588, fig. 2 [*Passer rutilans*].
Temminck (1839). *Planches Color.*, Livr. **102** (Tab. Méth.): 108 [*Enodes*].
Temminck (1840). *Man. d'Orn. Tabl. Syst.*, 2nd edition, **4**: 600 [*Tchagra senegalus cucullatus*].
Temminck & Schlegel (1847). In: Siebold, *Fauna Jap., Aves*: plate 43 [*Garrulus glandarius japonicus*].
Thayer & Bangs (1909). *Bull. Mus. Comp. Zool. Harvard* **52**: 140 [*Nucifraga caryocatactes macella*].
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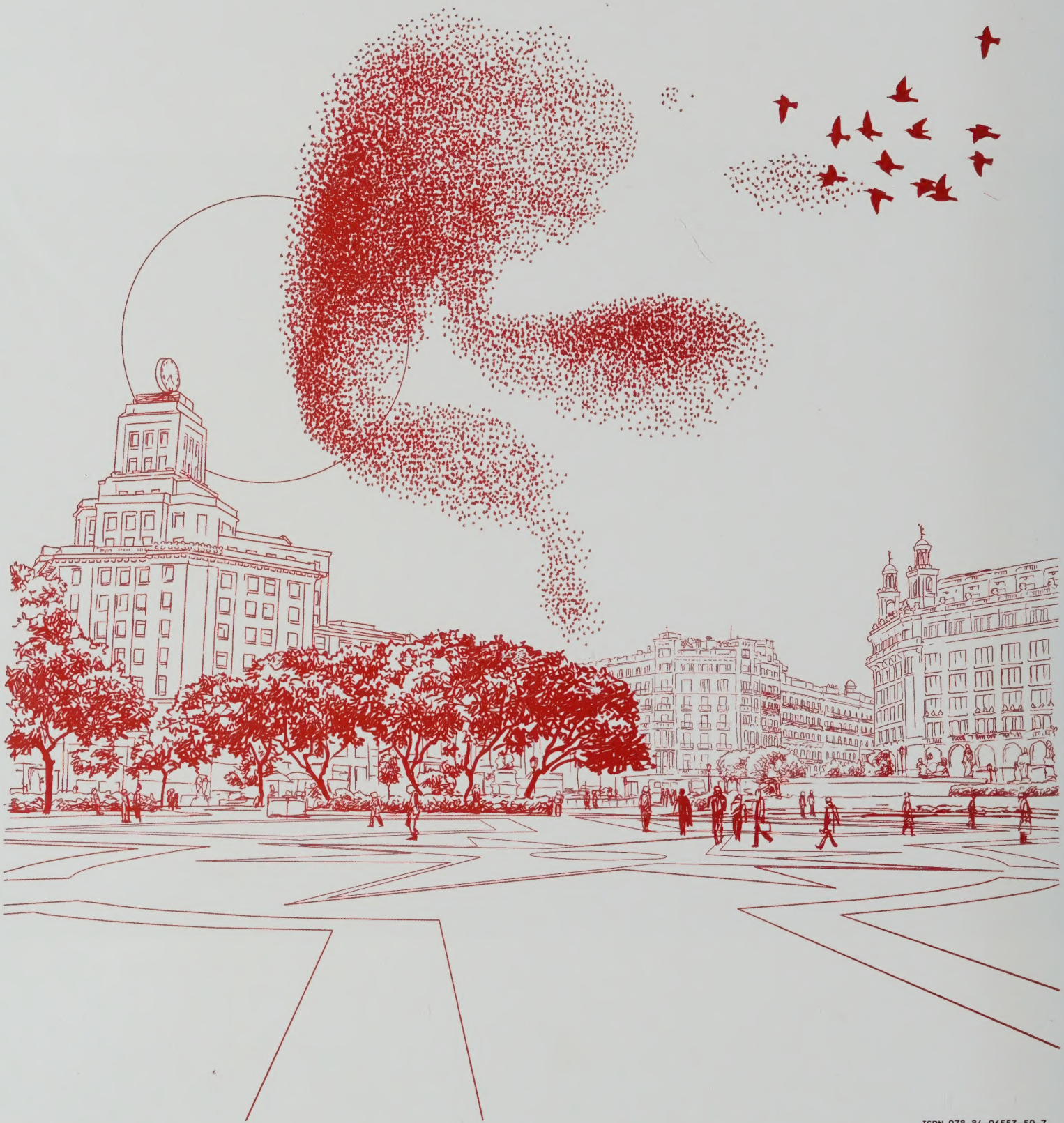
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